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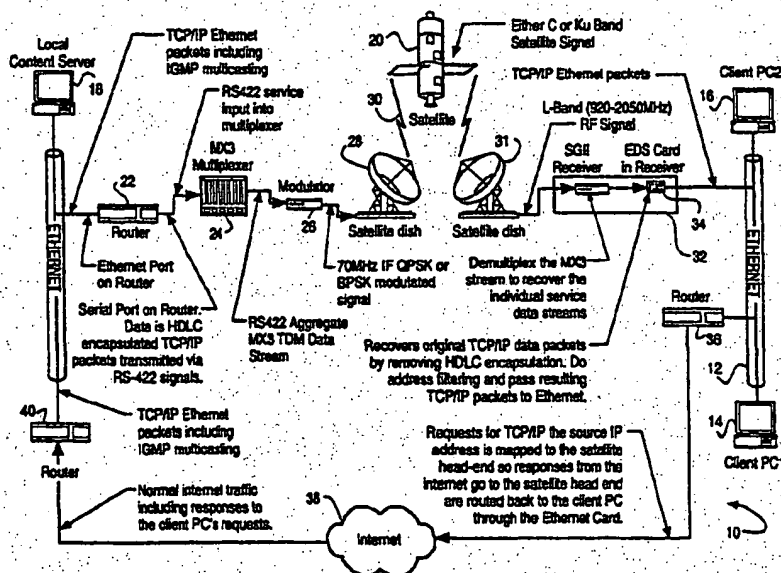
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(54) Title: ETHERNET DIGITAL STORAGE (EDS) CARD AND SATELLITE TRANSMISSION SYSTEM

(57) Abstract

An Ethernet Digital Storage (EDS) Card (34) and satellite transmission system (10) is provided for receiving, storing and transmitting files including video, audio, text, and multimedia files, especially files received via satellite transmission. In a preferred embodiment, a satellite system includes a receiver (32) using the EDS Card (34). A data stream is received by the receiver (32) and then may be stored at the receiver or directly routed as TCP/IP packets. Received or stored data files may be multicast. The EDS Card (34) also includes an HTTP server for web access to the card parameters and any files stored on the card.

A DHCP on the EDS Card (34) provides dynamic configuration of the card's IP address. The EDS card (34) also includes a PPP and modem processor for the file transmission, reception, and affidavit collection. The EDS card (34) also includes an event scheduler for triggering files at a predetermined time or at an external prompt. A command processor keeps a built-in log of audio spots played and responds to a command originator when a command is received. Files may be transmitted from the EDS Card (34) via a M & C port, an Ethernet port, or an auxiliary RS-232 port. Files may be received by the EDS Card (34) from a data stream from a satellite, a M & C port, an Ethernet port or an auxiliary RS-232 port. The EDS Card (34) also provides time shifting and may be used without a satellite feed as an HTTP-controlled router with storage.



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TITLE OF THE INVENTION

Ethernet Digital Storage (EDS) Card and Satellite Transmission System

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CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of two U.S. Patent Applications; (1) U.S. Provisional Patent Application Serial No. 60/105,468, filed October 23, 1998, entitled "Apparatus and Method Of Use For Local Receiver Storage, Decoding and Output"; and (2) 15 U.S. Utility Patent Application Serial No. 09/287,200, filed April 3, 1999, entitled "Satellite Receiver/Router, System, and Method of Use" which is a continuation of a prior provisional U.S. patent application Serial No. 60/105,878, filed October 27, 1998, entitled "Ethernet Satellite Delivery Apparatus". The disclosures of all the aforementioned applications are 20 incorporated herein by reference.

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STATEMENT REGARDING FEDERALLY
SPONSORED RESEARCH AND DEVELOPMENT

Not applicable.

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BACKGROUND OF THE INVENTION

The present invention generally relates to an Ethernet Digital Storage (EDS) Card, satellite transmission system, and method for data delivery or advertising. More particularly, the present invention relates to an EDS Card for receiving, storing, and transmitting files including video, audio, text, and multimedia files, especially files received via satellite transmission.

The effort to develop a system for error-free, time-crucial distribution of bandwidth consumptive files has driven the data delivery industry for some time. Within the broadcasting industry, especially radio broadcasting, private network systems have been developed to facilitate the distribution of audio files for subsequent radio broadcasting. These private network systems often use satellites as "bent-pipes" to deliver their content reliably and quickly. These private network systems have evolved from primitive repeaters to systems allowing the receiving station greater degrees of interaction and reliability.

The Internet is an enormous network of computers through which digital information can be sent from one computer to another. The Internet's strength - its high level of interconnectivity - also poses severe problems for the prompt and efficient distribution of voluminous digital information, particularly digitized imaging, audio, or video information, such as an audio broadcast transmission. Internet service providers (ISP's) have attempted to accelerate the speed of delivery of content to Internet users by delivering Internet content (e.g., TCP/IP packets) to the user through a satellite broadcast system. One such system is the direct-to-home ("DTH") satellite delivery system such as that offered in connection with the trademark, "DirecPC." In these DTH types of systems, each subscriber or user of the system must have: (i) access to a satellite dish; (ii) a satellite receiver connected to the satellite dish and mounted in the user's PC; and (iii) an Internet back channel in order to request

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information from Internet Web sites. The DTH system is thus quite costly, since each user must have its own receiver and connection to a satellite dish. The DTH system is also somewhat difficult to deploy since the satellite antenna and receiver is mounted in each DTH user's PC.

- 5 The DTH system also does not take advantage of pre-existing satellite systems, and it often is a single carrier system, dedicated to the delivery of Internet content to the user. It does not allow the user flexibility to receive, much less distribute to others, other types of services, such as non-Internet radio broadcast or faxing services for example. The DTH systems also typically modify the IP packets at the head end, thus introducing significant
10 processing delay through the need to reconstruct packets on the receiving end.

DTH systems typically utilize the DVB standard, in which event the system might broadcast other services. DVB systems, however, utilize a statistical data carrier. For this and other reasons, the DVB systems often cause significant additional delay due to the need to reconstruct packets from the statistically multiplexed carrier sent through DVB system.

- 15 DTH system also add significant overhead to the data stream they provide, thus requiring additional bandwidth and associated costs in order to process and deliver DVB data streams.

- The DTH system is also typically quite limited in its bandwidth capabilities. The consumer DirecPC system, for example, is limited to 440 kbps, thus limiting its effectiveness
20 as a reliable, flexible, and quick distribution vehicle for Internet content, particularly voluminous content, to all users of the system through the one carrier.

Another system used by ISP's and others to deliver Internet content through satellites is the use of commercial or professional quality satellite receivers in conjunction with traditional Internet routers connected into an ISP LAN or similar LAN for delivery of the

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received content through its LAN to its subscribers either on the LAN or through modems and telecommunications lines interconnecting the modems. (See Prior Art Figure 3.) These types of separate receiver-and-router satellite systems have typically required use of traditional satellite data receivers with integrated serial (often RS-422) interfaces or data
5 outputs. The data output is connected into the router, which then converts the data into Ethernet compatible output and routes and outputs the Ethernet onto the LAN.

The applicant has discovered that these prior art data receiver and separate router systems present many problems. For example, the traditional data receivers are relatively inflexible and support only one or two services; and the use of a separate router is expensive.
10 In addition, these types of systems usually employ a DVB transport mechanism, which not well suited to transmitting Internet and similar types of content for a number of reasons. One reason is that, as noted above, the DVB transport protocol and mechanism add substantial delays into the system. Another is that, as the applicant has discovered, the DVB transport mechanism utilizes excessive amounts of bandwidth.

15 In addition, prior art data receiver and separate router systems often employ a separate storage memory, often linked to the router via a Local Area Network (LAN) which adds further expense, complication, and bandwidth consumption. Also, prior art systems are often awkward to adjust, to the extent that the prior art systems are adjustable at all. Additionally, prior art receivers typically are unable to provide multicasting and expensive multicasting
20 routers must be added to the system to support multicasting.

The applicants have attempted to solve many problems through the development of several prior art satellite data transmission systems and modules, available from StarGuide Digital Networks, Inc. of Reno, Nevada, that may be added to a receiver including an Asynchronous Services Statistical Demux Interface Module, a Digital Video Decoder

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Module, an MX3 Digital Multimedia Multitplexer, a Digital Audio Storage Module, and a Digital Multimedia Satellite Receiver. However, cost, efficiency, and reliability may still be improved.

Additionally, in the field of broadcasting, advertising is a major source of revenue.

- 5 However, radio broadcasting of several types of advertising, such as national advertising campaigns, is often disfavored. In national advertising campaigns, advertising "spots" are often localized to the region in which the spot will be played. For example, an advertising spot to be run in Chicago might be localized by including voice content from a Chicago personality, or including a reference to Chicago. Spot localization and distribution is
- 10 extremely cumbersome in prior art systems. Often prior art systems require audio tapes to be generated at a centralized location and then physically mailed to a local broadcaster, which is costly, labor intensive and not time effective. The development of a distribution system providing reliable, fast and efficient delivery of content as well as increased automation capability throughout the system may be of great use in data delivery enterprises such as
- 15 nation ad campaign distribution and may lead to industry growth and increased profitability. For example, increased automation, ease of use and speed of distribution of a national ad campaign to a number of local broadcasters may allow increased broadcast advertising and may draw major advertising expenditures into national broadcasting advertising campaigns.

BRIEF SUMMARY OF THE INVENTION

The present invention provides an Ethernet Digital Storage (EDS) Card operable in a satellite data transmission system for storing and routing any kind of data including audio, video, text, image or multimedia files. Use of the present invention provides a satellite data transmission system with the ability to receive a multiplexed data stream of a variety of files, such as audio, video, data, images, and other multimedia files. Received files may be demultiplexed and stored automatically on the EDS Card locally in a flash memory storage. Files stored in the flash memory storage may be retrieved later. Alternatively, received files may be routed by the EDS Card over a network such as a Local Area Network (LAN). In a preferred embodiment, audio files may be retrieved, mixed with external audio, further manipulated and output as audio output. All files stored in the flash memory storage may be transmitted externally via an Ethernet Port, an M&C Port or a modem-enabled Auxiliary RS-232 Port. In addition to a data stream received from a satellite, files may be uploaded to the flash memory storage via an Ethernet Port, an M&C Port or a modem-enabled Auxiliary RS-232 Port. The EDS Card provides efficient multicasting via an IGMP multicasting processor. The EDS Card includes an HTTP server and a DNS resolver allowing the operation of the EDS Card and the contents of the flash memory storage to be accessible remotely via a web browser. The EDS Card provides a satellite receiver with a digital data, video, or audio storage and local insertion device, web site, Ethernet output device and router.

These and many other aspects of the present invention are discussed or apparent in the following detailed description of the preferred embodiments of the invention. It is to be understood, however, that the scope of the invention is to be determined according to the accompanying claims.

ADVANTAGES OF THE INVENTION

It is an object of the present invention to provide an EDS card capable of storing any kind of data , not just audio data. For example, the EDS card may be used to store text, numbers, instructions, images or video data.

5 It is an object of the invention to distribute TCP/IP compatible content by satellite.

It is an advantage of the present invention that it provides an Ethernet/Router card that can be mounted in a satellite receiver quickly, easily, and economically.

It is another advantage of the present invention that it provides a satellite receiver with the capability of receiving TCP/IP compatible content and routing and distributing it onto a
10 LAN or other computer network without need for a router to route the content onto the LAN or network.

It is still another advantage that the preferred card may be hot swappable and may be removed from the receiver without interfering with any other services provided by the receiver.

15 It is still another advantage of the present invention that the preferred card can be used in a receiver that can deliver other services, through other cards, in addition to those provided by the present invention itself. For example, other services, available from StarGuide Digital Networks, Inc. of Reno, Nevada that may be added to a receiver include an Asynchronous Services Statistical Demux Interface Module, a Digital Video Decoder Module, an MX3
20 Digital Multimedia Muiltplexer, a Digital Audio Storage Module, a Digital Audio Decoder, and a Digital Multimedia Satellite Receiver.

A still further advantage is that it provides satellite distribution of TCP/IP compatible content, eliminating the need for each PC receiving the content through the receiver to have its own dish or its own satellite receiver.

An additional advantage is that the present invention provides satellite TCP/IP distribution to PC's without having a satellite receiver being mounted in a PC and subject to the instability of the PC environment.

Yet an additional advantage is that the present card can preferably provide data services in addition to delivery of Internet content. Another advantage is that the satellite receiver in which the card is inserted preferably can provide yet additional services through other cards inserted in slots in the receiver.

Another advantage is that existing networks of satellite receivers can be adapted to deliver Internet services by mere insertion of the present cards in the receivers without having to replace the existing networks.

It is also an advantage of the present invention that the present system and insertion card preferably provides the ability to deliver TCP/IP content to Ethernet LAN's without need for custom software.

Another advantage is the present invention is that, both the overall system and the Ethernet/Router card in particular, process IP packets without modification or separation of the contents of the packets. The applicants' satellite transmission system and the present Ethernet/Router card are thus easier to implement; and since they process each IP packet as an entire block with no need to reconstruct packets on the receiving end, the system and the Ethernet/Router card more quickly process and route the IP packets from the head end to an associated LAN on the receiving end.

Another advantage of the present invention is that the Ethernet portion of the card uses an auto-negotiating 10/100 BT interface so that the card can integrate into any existing 10 BT or 100BT LAN.

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Another advantage is that the present invention includes a PPP connection to tie into an external modem so that the card can be tied to a distribution network via telco lines. This connection can be used for distribution as well as automatic affidavit and confirmation.

Another advantage of the present invention is DHCP (Dynamic Host Configuration Protocol) which allows the card's IP address to be automatically configured on an existing LAN supporting DHCP. This eliminates the need too manually configure the card's IP address.

Another advantage of the present invention is that the DNS (Domain Name Service) protocol has been added to allow the card to dynamically communicate with host web servers no matter what their IP address is.

Another advantage of the present invention is that an HTTP server (web server) has been added to the card so that it can be configured or monitored via a standard Web Browser. Additionally, the files stored on the EDS CARD may be downloaded or upload via a standard web browser.

Another advantage of the present invention is that the EDS Card includes an analog audio input port to allow a "live" feed to be mixed/faded with the locally stored audio. Additionally, an analog output is provided to allow auditioning of the local feed.

Another advantage of the present invention is that the EDS Card has a relay input port that allows external command of the card's behavior. Additionally, the card may be commanded via an Ethernet link, an Auxiliary RS-232 Port, a Host Interface Processor, or an received data stream.

Another advantage of the present invention is that the EDS Card includes a scheduler which allows the card to act at predetermined times to, for example, play an audio file and, if

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desired, to automatically insert such content into another content stream being received and output by the receiver and card.

Another advantage is that the present invention includes an IGMP multicasting processor to provide efficient multicasting to an attached LAN. Alternatively, the IGMP multicasting processor may be configured to allow a local router to determine the multicast traffic.

Another advantage of the present invention is that the EDS Card includes a local MPEG Layer II decoder to allow stored audio files to be converted to analog audio in real time.

Another advantage of the present invention is that the EDS may be configured as a satellite WAN with minimal effort and external equipment.

Another advantage is that the present invention allows a network to deploy a receiver system with, for example, an audio broadcasting capability, and later add additional capability such as Ethernet output, etc., by adding the EDS card of the present invention.

This prevents the user from having to replace the receiver, remove the audio card or utilize a separate satellite carrier for the transmission of differing content types.

There are many other objects and advantages of the present invention, and in particular, the preferred embodiment and various alternatives set forth herein. They will become apparent as the specification proceeds. It is to be understood, however, that the scope of the present invention is to be determined by the accompanying claims and not by whether any given embodiment achieves all objects or advantages set forth herein.

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BRIEF DESCRIPTION OF THE DRAWINGS

The applicants' preferred embodiment of the present invention is shown in the accompanying drawings wherein:

5 Figure 1 illustrates a block diagram of the EDS card of the present invention;

Figure 2 illustrates a hardware block diagram of the EDS Card of the present invention;

Figure 3 further illustrates some of the functionality of the EDS Card of the present invention;

10 Figure 4 is a block diagram showing the applicant's preferred uplink configuration utilizing a multiplexer to multiplex the satellite transmission;

Figure 5 is a block diagram of the applicants' preferred downlink configuration for reception of a multiplexed satellite transmission for distribution onto an associated LAN;

15 Figure 6 is a block diagram of the applicants' preferred redundant uplink configuration for clear channel transmission of up to 10 mbps;

Figure 7 is a block diagram of the applicants' preferred redundant uplink configuration for clear channel transmission of up to 50 mbps;

20 Figure 8 is a block diagram of one embodiment of the applicants' preferred satellite transmission system, with an Internet backchannel, in which the applicants' preferred EDS card has been inserted into a slot in a satellite receiver in order to distribute Internet content through the card onto an Ethernet LAN to which the card is connected;

Figure 9 is a block diagram of an alternative embodiment of the applicants' preferred satellite transmission system for distribution of TCP/IP content onto an intranet with a

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telecommunications-modem-provided backchannel from the receiver to the headend of the intranet;

Figure 10 is a block diagram of a prior art satellite data receiver, separate Internet router, and LAN, as described in the BACKGROUND section above.

- 5 Figure 11 illustrates a flowchart of the present invention employed to distribute data or content, for example, audio advertising, from a centralized origination location to a number of geographically diverse receivers.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 illustrates a block diagram of the EDS card 100. The EDS card 100 includes a StarGuide backplane 102, an HDLC Processor 104, a host interface processor 106, a Network Protocol Filtering (Stack) processor 108, a local message filtering processor 110, a Store and forward address/file filtering processor 112, a flash memory storage 114, an audio decoder 116, a decoder monitor and control processor 118, an audio filter 120, an audio mixer/fader 122, an audio driver 124, an audio output port 126, an audio input port 128, an audio receiver 130, an audio audition port 132, an event scheduler 134, a relay input processor 138, a relay input port 140, a RS-232 Transceiver 142, and M&C Port 144, a 10/100BT Ethernet Transceiver 146, an Ethernet Port 148, a confirmation web client 150, a PPP and modem processor 152, an RS-232 Transceiver 154, an Auxiliary RS-232 Port 156, an IGMP multicasting processor 158, an HTTP Server 160, a DHCP Processor 162, and a DNS Resolver 164.

In operation, the StarGuide backplane 102 interfaces with a receiver, preferably the prior art StarGuide® II Receiver (not shown), available from StarGuide Digital Networks, Inc., Reno, Nevada. The Backplane 102 provides the EDS card 100 with a clock 101 and an HDLC packetized TCP/IP data stream 103. As mentioned above, the TCP/IP data stream may represent, audio, video, text, image or other multimedia information, for example. The clock 101 and the data stream 103 are provided to the HDLC processor 104 which depacketizes the data stream 103 and outputs TCP/IP packets to the network protocol filtering (stack) processor 108. The stack processor 108 may be configured to control the overall function and data allocation of the EDS card 100. The stack processor 108 may send the received data stream to any one of the IGMP multicasting processor 158, the HTTP Server 160, the DHCP Processor 162, the DNS resolver 164, the confirmation web client 150,

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the 10/100BT Ethernet Transceiver 146, the PPP and modem processor 152 or the local message filtering processor 110 as further described below. The stack processor 108 may be controlled by commands embedded in the data stream, commands sent through the M&C Port 144, commands sent through the Ethernet Port 148, commands through the Host interface processor 106, or commands received through the Auxiliary RS-232 port 156. These commands may be expressed in ASCII format or in the StarGuide Packet Protocol. The commands received by the stack processor 108 via the Ethernet Port 148 may use various interfaces including Simple Network Management Protocol (SNMP), Telnet, Hyper Text Transfer Protocol (HTTP) or other interfaces. The externally receivable operation commands for the stack processor 108 are set forth in APPENDIX A.

The stack processor 108 may further decode a received data stream to send a raw message 109 to the local message filtering processor 110. The local message filtering processor 110 determines if the raw message 109 is a content message such as audio, video, or text, for example, or a command message. The local message filtering processor 110 passes content messages 111 to the Store and forward address/file filtering processor 112 and passes command messages 135 to the command processor 136. The Store and forward address/file filtering processor 112 generates encoded files 113 which are passed to the flash memory storage 114.

The flash memory storage 114 stores the encoded files 113. encoded files stored in the flash memory storage 114 may be passed to the audio decoder 116 if the encoded files are audio files. Encoded files 172 other than audio files may be passed from the flash memory storage 114 to the stack processor 108 for further transmission. The flash memory storage 114 preferably stores at least up to 256 audio files or "spots". The flash memory storage 114 preferably uses MUSICAM MPEG Layer II compression with a maximum spot size up to the

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storage capacity if the file stored is a compressed audio file. Other files, such as compressed video files, may be stored using MPEG2 compression or an alternative compression protocol. The storage capacity of the flash memory storage 114 is preferably at least 8 MB to 144 MB which is roughly equivalent to 8 to 144 minutes of digital audio storage at 128 kbps MPEG
5 audio encoding. The flash memory storage 114 preferably supports insertion activation with the relay contract closure in absolute time and supports an insertion mode with or without cross-fading.

The audio decoder 116 decodes the encoded files 115 and generates an analog audio signal 117. The audio decoder 116 is monitored by the decoder monitor and control
10 processor 118 while the audio decoder 116 decodes the encoded files 115. The analog audio signal 117 is passed to the audio filter 120 where the analog audio signal 117 is further filtered to increase its audio output quality. The audio decoder 116 includes an MPEG Layer II decoder allowing the pre-encoded stored files from the flash memory storage 114 to be converted to analog audio signals 117 in real time. The analog audio signal is then passed
15 from the audio filter 120 to the audio mixer/fader 122 and the audio audition port 132. The analog audio signal 119 received by the audio audition port 132 may be passed to an external listening device such as audio headphones to monitor the audio signal. The audio audition port 132 of the EDS card allows the locally stored audio to be perceived without altering the output audio feed through the audio output port 126. The audio audition port 132 may be of
20 great use when the audio output port 126 output is forming a live broadcast feed.

An external audio signal may be received by the audio input port 128. The external audio signal is then passed to the audio receiver 130 and the resultant analog audio signal 131 is passed to the audio mixer/fader 122. The audio mixer/fader may mix or fade an external analog audio signal 131 (if any) with the audio signal received from the audio filter 120. The

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output of the audio mixer/fader is then passed to the audio driver 124 and then to the audio output port 126. Also, the audio input port 128 allows a "live" audio feed to be mixed or faded at the audio mixer/fader 122 with a locally stored audio spot from the flash memory storage 114. The audio mixer/fader allows the live feed and the local (stored) feed to be mixed, cross faded or even amplified. Mixing entails the multiplication of two signals. Cross fading occurs when two signals are present over a single feeds and the amplitude of a first signal is gradually diminished while the amplitude of a second signal is gradually increased. Mixing, amplification, and cross fading are well known to those skilled in the art.

As mentioned above, the flash memory storage 114 may store a large number of audio spot files in addition to files such as video, text or other multimedia, for example. Files stored in the flash memory storage 114 are controlled by the event scheduler 134. The event scheduler 134 may be controlled through the relay input processor 138 of the relay input port 140 or through the command processor 136. The command processor 136 may receive programming including event triggers or command messages through the local message filtering processor 110 and the stack processor 108 from the M&C Port 144, the Auxiliary RS-232 Port 156, the Ethernet Port 148, the received data stream 103, or the Host interface processor 106.

For example, with respect to audio spots stored in the flash memory storage 114, the audio spots may be triggered at a pre-selected or programmed time by the event scheduler 134. The event scheduler 134 may receive audio spot triggers from either the command processor 136 or the relay input processor 138. The command processor 136 may receive programming including event triggers from the M&C Port 144, the Auxiliary RS-232 Port 156, the Ethernet Port 148, the received data stream 103, or the Host interface processor 106. External audio spot triggers may be received directly by the relay input port 140 which passes

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digital relay info 141 of the audio spot trigger to the relay input processor 138. Additionally, the local message filtering processor 110 may detect a command message in the raw message 109 it receives from the stack processor 108. The command message detected by the local message filtering processor 110 is then passed to the command processor 136. Also, the
5 command processor 136 may be programmed to trigger an event at a certain absolute time. The command processor 136 receives absolute time information from the StarGuide backplane 102.

Additionally, once the command processor 136 receives a command message, the command processor 136 sends a response message to the command originator. For example,
10 when the command processor 136 receives a command message from the M&C Port 144, the command processor 136 sends a response message 145 to the M&C Port 144 via the RS-232 Transceiver 142. Similarly, when a command message is received from the Ethernet Port 148, Auxiliary RS-232 Port 156, or Host interface processor 106, the command processor 136 sends a response message through the stack processor 108 to the command originating port to
15 the command originating device. When a command message is received from the received data stream 103, a response may be sent via one of the other communication ports 148, 156, 106 or no response sent.

In addition to activating audio spots, the event scheduler 134 may trigger the flash memory storage 114 to pass a stored encoded file 172 to the stack processor 108. The
20 encoded file 172 may be audio, video, data, multimedia or virtually any type of file. The stack processor 108 may further route the received encoded file 172 via the Ethernet Port, 148, the Auxiliary RS-232 Port 156, or the M&C Port 144 to an external receiver. Additionally, the stack processor 108 may repackage the received encoded data file 172 into

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several different formats such as multicast via the GMP Multicasting Processor 158, or HTTP via the HTTP server 160, telnet, or SNMP for external transmission.

The 10/100BT Ethernet Transceiver 146 receives data from the stack processor 108 and passes the data to the Ethernet Port 148. The 10/100BT Ethernet Transceiver 146 and
5 Ethernet Port 148 may support either 10BT or 100BT Ethernet traffic. The 10/100BT Ethernet Transceiver 146 uses an auto-negotiating 10/100BT interface so that the EDS card 100 may easily integrate into an existing 10BT or 100BT LAN. In addition to supplying data to an existing 10BT or 100BT LAN via the Ethernet Port 148, the stack processor 108 may receive data from an external network via the Ethernet Port 148. External data passes from
10 the Ethernet Port 148 through the 10/100BT Ethernet Transceiver 146 to the stack processor 108. The external data may constitute command messages or audio or video data for example.

The EDS card 100 also includes a PPP and modem processor 152. The PPP and modem processor may be used for bi-directional communication between the stack processor
15 108 and the Auxiliary RS-232 Port 156. The PPP and modem processor 152 reformats the data for modem communication and then passes the data to the RS-232 Transceiver 154 of the Auxiliary RS-232 Port 156 for communication to an external receiving modem (not shown). Data may also be passed from an external modem to the stack processor 108. The PPP and modem processor 152 allows the EDS card 100 to communicate with an external
20 modem so that the EDS card may participate in a distribution network via standard telecommunications lines, for example. The PPP and modem processor 152 may be used for distribution as well as automatic affidavit and confirmation tasks.

The EDS card 100 also includes an Internet Group Multicasting Protocol (IGMP) Multicasting Processor 158 receiving data from and passing data to the stack processor 108.

The IGMP multicasting processor 158 may communicate through the stack processor 108 and the Ethernet Port 148 or the Auxiliary RS-232 Port 156 with an external network such as a LAN. The IGMP multicasting processor 158 may be programmed to operate for multicasting using IGMP pruning, a protocol known in the art, for multicasting without using IGMP

5 Pruning (static router) and for Unicast routing.

When the IGMP multicasting processor 158 is operated using the IGMP pruning, the IGMP multicasting processor 158 may be either an IGMP querier or a non-querier. When the IGMP multicasting processor 158 is operated as a querier, the IGMP multicasting processor 158 periodically emits IGMP queries to determine if a user desires multicasting traffic that
10 the EDS Card 100 is currently receiving. If a user desired multicasting traffic, the user responds to the IGMP multicasting processor 158 and the IGMP multicasting processor 158 transmits the multicast transmission through the stack processor 108 to an external LAN. The IGMP multicasting processor 138 continues emitting IGMP queries while transmitting the multicast transmission to the external user and the external user continues responding
15 while the external user desires the multicast transmission. When the user no longer desires the multicast transmission, the user ceases to respond to the IGMP queries or the user issues an IGMP "leave" message. The IGMP multicasting processor detects the failure of the user to respond and ceases transmitting the multicast transmission.

Under the IGMP Protocol, only one IGMP querier may exist on a network at a given
20 time. Thus, if, for example, the network connected to the Ethernet Port 148 already has an IGMP enabled router or switch, the IGMP multicasting processor 158 may be programmed to act as a non-querier. When the IGMP multicasting processor 158 acts as a non-querier, the IGMP multicasting processor manages and routes the multicasting traffic, but is not the

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querier and thus does not emit queries. The IGMP multicasting processor 138 instead responds to commands from an external router.

When the IGMP multicasting processor 158 performs multicasting without using IGMP pruning, the IGMP multicasting processor 158 acts as a static router. The IGMP multicasting processor 158 does not use IGMP and instead uses a static route table that may be programmed in one of three ways. First, the IGMP multicasting processor 158 may be programmed to merely pass through all multicast traffic through the stack processor 108 to an external LAN. Second, the IGMP multicasting processor 158 may be programmed to pass no multicast traffic. Third, the IGMP multicasting processor 158 may be programmed with a static route table having individual destination IP address or ranges of destination IP addresses. Only when the IGMP multicasting processor 158 receives multicast traffic destined for an IP address in the static route table, the multicast traffic is passed to the external LAN.

When the IGMP multicasting processor 158 performs Unicast routing, the IGMP multicasting processor 158 acts as a static router wherein received traffic is not multicast and is instead delivered only to a single destination address. As when performing multicast routing without IGMP pruning, the IGMP Multicast Processor 158 uses a static route table and may be programmed in one of three ways. First, to merely pass through received traffic to its individual destination address. Second, to pass no Unicast traffic. Third, the IGMP multicasting processor 158 may be programmed with a static route table having individual destination IP addresses and the IGMP multicasting processor 158 may pass traffic only to one of the individual destination IP addresses.

The IGMP multicasting processor 158 may be programmed via the M&C Port 144, the Ethernet Port 148, the Auxiliary RS-232 Port 156, the Host interface processor 106 or the

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received data stream 103. Additionally, the IGMP multicasting processor 158 may multicast via the Auxiliary RS-232 Port 156 in addition to the Ethernet Port 148.

The EDS card 100 also includes an HTTP Server 160 (also referred to as a Web Server). The HTTP Server 160 receives data from and passes data to the stack processor 108.

- 5 Data may be retrieved from the HTTP Server 160 by an external device through either a LAN communicating with the Ethernet Port 148 or a modem communicating with the Auxiliary RS-232 Port 156. Either the modem or the LAN may transmit an HTTP data request command to the stack processor 108 via their respective communication channels, (i.e., the PPP and modem processor 152 and the 10/100BT Ethernet Transceiver respectively). The
- 10 stack processor 108 transmits the received data request command to the HTTP Server 160 which formats and transmits a response to the stack processor 108 which transmits the response back along the appropriate channel to the requestor.

- Preferably, the HTTP Server 160 may be used to allow the EDS Card 100 to be configured and monitored via a standard Web Browser accessible through both the Ethernet
- 15 Port 148 or the Auxiliary RS-232 port. Additionally, the HTTP Server 160 allows a web browser access to the files stored in the flash memory storage 114. Files may be downloaded for remote play, may be modified and up loaded, or may be played through the web browser. Additionally, the event scheduler 134 may be controlled with a web browser via the HTTP Server 160. The HTTP Server 160 allows complete remote access to the functionality of the
- 20 EDS Card 114 and the contents of the flash memory storage 114 through a convenient web browser. Additionally, the HTTP Server 160 allows new files to be uploaded to the flash memory storage 114 via a convenient web browser. Use of the HTTP Server 160 in conjunction with a web browser may be the preferred way of monitoring the function and content of the EDS Card 100 remotely.

The EDS card 100 also includes a DHCP Processor 162 receiving data from and passing data to the stack processor 108. The DHCP Processor 162 provides Dynamic Host Configuration Protocol services for the EDS card 100. That is, the DHCP Processor allows the EDS card's 100 IP address to be automatically configured on an existing LAN supporting DHCP. The DHCP Processor thus eliminates the need to manually configure the EDS card's 100 IP address when the EDS card 100 is operated as part of a LAN supporting DHCP. In operation, the DHCP Processor 162 communicates with an external LAN via the Ethernet Port 148. IP data is passed from the external LAN through the Ethernet Port 148 and 10/100BT Ethernet Transceiver 146 and the stack processor 108 to the DHCP Processor 162 where the IP data is resolved and the dynamic IP address for the EDS card 100 is determined. The EDS card's 100 IP address is then transmitted to the external LAN via the stack processor 108, 10/100BT Ethernet Transceiver 146 and Ethernet Port 148. Additionally, the DHCP Processor 163 determines if the external LAN has a local DNS server. When the external LAN has a local DNS server the DHCP Processor 163 queries the local DNS server for DNS addressing instead of directly quering an internet DNS server. Also, the DHCP Processor 162 allows the IP address for the EDS Card 100 to be dynamically reconfigured on an existing LAN supporting DHCP.

The EDS card 100 also includes a DNS Resolver 164 receiving data from and passing data to the stack processor 108. The DNS Resolver 164 provides Domain Name Service to the EDS card 100 to allow the EDS card to dynamically communicate with external host web servers regardless of the web server IP address. In operation, the DNS Resolver 164 communicates with an external host web server via the stack processor 108 and either the Ethernet Port 148 or the Auxiliary RS-232 Port 156. The DNS Resolver 164 receives IP address information from the external host web server and resolves mnemonic computer

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addresses into numeric IP addresses and vice versa. The resolved IP address information is then communicated to the stack processor 108 and may be used as destination addressing for the external host web server.

The EDS Card 100 also includes a confirmation web client 150 receiving data from
5 and passing data to the stack processor 108. When a data file, such as an audio file, is received by the EDS Card 100, the confirmation web client 150 confirms that the EDS Card 100 received the data by communicating with an external server preferably an HTTP enabled server such as the StarGuide® server. The confirmation web client's 150 confirmation data may be transmitted via either the Ethernet Port 148, the Auxiliary Port 156 or both.
10 Additionally, once a file, such as an audio spot is played or otherwise resolved, the confirmation web client 150 may also send a confirmation to an external server preferably an HTTP enabled server such as the StarGuide® server. The confirmation web client's 150 confirmation may be then be easily accessed via web browser from the HTTP enabled server.

The flash memory storage 114 operates in conjunction with the event scheduler 134
15 and the command processor 136 to provide audio insertion capability and support for manual and automatic sport insertion, external playback control via the relay input port 140, Cross-Fade via the audio mixer/fader 122 and spot localization. The command processor 136 also maintains a built-in log of audio spots played. The built-in log may be retrieved through the M&C Port 144, the Ethernet Port 148, or the Auxiliary RS-232 Port 156. The built-in log
20 may assist affidavit collection for royalty or advertising revenue determination, for example.

The Host interface processor 106 receives data from and transmits data to the StarGuide backplane 102. The Host interface processor 106 allows the EDS Card 100 to be controlled via the front panel (not shown) of the receiver in which the EDS Card 100 is mounted. The Host interface processor 106 retrieves from the command processor 136 the

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current operating parameters of the EDS Card 100 for display on the front panel of the receiver. Various controls on the front panel of the receiver allow users to access locally stored menus of operating parameters for the EDS Card 100 and to modify the parameters. The parameter modifications are received by the Host Processor 106 and then transmitted to the command processor 136. The Host interface processor 106 also contains a set of initial operating parameters and interfaces for the EDS Card 100 to support plug-and-play setup of the EDS Card 100 within the receiver.

As described above, the EDS card 100 includes many useful features such as the following. The EDS card 100 includes the audio input port 128 to allow a "live" audio feed to be mixed or faded at the audio mixer/fader 122 with a locally stored audio spot from the flash memory storage 114. Also, the audio mixer/fader allows the live feed and the local (stored) feed to be mixed, cross faded or even amplified. Additionally, the EDS card's 100 relay input port 140 allows external triggering of the EDS card including audio event scheduling. Also, the event scheduler 134 allows the EDS card to play audio files at a predetermined time or when an external triggering event occurs. Additionally, the audio decoder 116 includes an MPEG Layer II decoder allowing the pre-encoded stored files from the flash memory storage 114 to be converted to analog audio signals 117 in real time. Also, the audio audition port 132 of the EDS card allows the locally stored audio to be perceived without altering the output audios feed through the audio output port 126. The audio audition port 132 may be of great use when the audio output port 126 output is forming a live broadcast feed.

The features of the EDS card 100 also include the ability to receive files from a head end distribution system (such as ExpressNet) based on the EDS card's unique stored internal address. Once the EDS Card 100 receives an ExpressNet digital package, the EDS Card 100

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may send a confirmation via the Ethernet Port 148 or the Auxiliary RS-232 port 156 to the package originator. Also, the IGMP multicasting processor 158 of the EDS card 100 provides locally configured static routing which allows certain IP addresses to be routed from a satellite interface through the EDS card 100 directly to the Ethernet Port 148. Also, the

5 EDS Card 100 supports a variety of communication interfaces including HTTP, telnet, and SNMP to allow configuration and control of the EDS Card 100 as well as downloading, uploading, and manipulation of files stored on the flash memory storage 114.

Additionally, because the traffic received by the EDS Card 100 is HDLC encapsulated, the traffic received by the EDS Card 100 appears as if it is merely arriving

10 from a transmitting router and the intervening satellite uplink/downlink is transparent. Because of the transparency, the EDS Card 100 may be configured as a satellite Wide Area Network WAN with minimal effort and additional equipment.

In general, the EDS Card 100 is an extremely flexible file storage and transmission tool. The EDS Card 100 may be programmed through the Host interface processor 106, the

15 M&C Port 144, the Auxiliary RS-232 Port 156, the received data stream 103, and the Ethernet Port 148. It may be preferable to program the EDS Card 100 through the Host interface processor 106 when programming from the physical location of the EDS card 100. Alternatively, when programming the EDS Card 100 remotely, it may be preferable to program the EDS Card 100 via the Ethernet Port 148 because the Ethernet Port 148 supports

20 a much higher speed connection.

In addition, files such as audio, video, text, and other multimedia information may be received by the EDS card 100 through the received data stream 103, the M&C Port 144, the Auxiliary RS-232 Port 156, and the Ethernet Port 148. Preferably, files are transmitted via the received data stream 103 or the Ethernet Port 148 because the received data stream 103 and

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the Ethernet Port 148 support a much higher speed connection. Also, files such as audio, video, text and other multimedia information may be transmitted by the EDS card 100 through the M&C Port 144, the Auxiliary RS-232 Port 156, and the Ethernet Port 148.

Preferably, files are transmitted via the Ethernet Port 148 because the Ethernet Port 148

5 supports a much higher speed connection. Audio files may also be transmitted via the audio output port 126 in analog form.

Additionally, the EDS Card 100 may perform time-shifting of a received data stream 103. The received data stream 103 may be stored in the flash memory storage 114 for later playback. For example, an audio broadcast lasting three hours may be scheduled to begin at 10 9am, New York time in New York and then be scheduled to begin an hour later at 7am. Los Angeles time in Los Angeles. The received data stream 103 constituting the audio broadcast may be received by an EDS Card in California and stored. After the first hour is stored on the California EDS Card, playback begins in California. The EDS card continues to queue the received audio broadcast by storing the audio broadcast in the flash memory storage while 15 simultaneously triggering, via the event scheduler 134, the broadcast received an hour ago to be passed to the audio decoder and played.

Figure 2 illustrates a hardware block diagram of the EDS Card 200. The EDS Card 200 includes a Backplane Interface 210, a Microprocessor 210, a Serial NV Memory 215, a Reset Circuit 220, a 10/100BT Transceiver 225, a 10/100BT Ethernet Port 230, a RS-232 4 20 Channel Transceiver 235, a M&C Port 240, an Opto-Isolated Relay Input 245, a Digital Port 250, an audio decoder 255, and audio filter 260, a Mixer/Amplifier 265, a Balanced Audio Receiver 270, a Balanced audio driver 275, an Audio Port 280, a Boot Flash, 285, an Application Flash 287, an SDRAM 90, and a Flash Disk 295.

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In operation, the Backplane Interface 205 performs as the StarGuide backplane 102 of Figure 1. The Microprocessor 210 includes the HDLC Processor 104, the Host interface processor 106, the stack processor 108, the local message filtering processor 110, the Store and forward address/file filtering processor 112, the event scheduler 134, the command processor 136, the decoder monitor and control processor 118, the relay input processor 138, the confirmation web client 150, the PPP and modem processor 152, the IGMP multicasting processor 158, the HTTP Server 160, the DHCP Processor 162, and the DNS Resolver 164, as indicated by the shaded elements of Figure 1. The Serial NV Memory 215 stores the initial command configuration used at power-up by the command processor 136. The Reset Circuit 220 ensures a controlled power-up. The 10/100BT Transceiver performs as the 10/100BT Ethernet transceiver 146 of Figure 1 and the 10/100BT Ethernet Port 230 performs as the Ethernet Port 148 of Figure 1. The RS-232 4 Channel Transceiver 235 performs as both the RS-232 Transceiver 142 and the RS-232 Transceiver 154 of Figure 1. The Digital Port 250 in conjunction with the RS-232 Channel Transceiver 235 performs as the Auxiliary RS-232 Port 156 of Figure 1. The M&C Port 240 performs as the M&C Port 144 of Figure 1. The Opto-Isolated Relay Input 245 and the Digital Port 250 perform as the relay input port 140. The audio decoder 255, audio filters 260, Mixer/Amplifiers 265, Balanced audio receiver 270, Balanced audio drivers 275 and Audio Port 280 perform as the audio decoder 116, audio filter 120, audio mixer/fader 122, audio receiver 130, audio driver 124, and audio output port 126 respectively of Figure 1. The Flash Disk 295 performs as the flash memory storage 114 of Figure 1.

The Boot Flash 285, Application Flash 287, and SDRAM 290 are used in the start-up and operation of the EDS Card 100. The Boot Flash 285 holds the initial boot-up code for the microprocessor operation. When the Reset Circuit 220 is activated, the Microprocessor

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210 reads the code from the Boot Flash 285 and then performs a verification of the Application Flash 287. The Application Flash 287 holds the application code to run the microprocessor. Once the Microprocessor 210 has verified the Application Flash 287, the application code is loaded into the SDRAM 290 for use by the microprocessor 210. The SDRAM 290 holds the application code during operation of the EDS Card 100 as well as various other parameters such as the static routing table for use with the IGMP Multicasting Microprocessor 158 of Figure 1.

The microprocessor 210 is preferably the MPC860T microprocessor available from Motorola, Inc. The Reset Circuit 220 is preferably the DS1233 available from Dallas Semiconductor, Inc. The 10/100BT Ethernet Transceiver 225 is preferably the LXT970 available from Level One, Inc. The audio decoder 255 and the Mixer Amplifier 265 are preferably the CS4922 and CS3310 respectively, available from Crystal Semiconductor, Inc. The Flash Disk 295 is preferably a 144Mbx8 available from M-Systems, Inc. The remaining components may be commercially obtained from a variety of vendors.

Figure 3 further illustrates some of the functionality of the EDS Card 300 of the present invention. Functionally, the EDS card 300 of the present invention includes an IP Multicast Router 310, a Broadband Internet Switch 320, a High Reliability Solid State File Server 330, and a High Reliability Solid State Web Site 340. The EDS card 300 may receive data from any of a number of Internet or Virtual Private Network (VPN) sources including DSL 350, Frame Relay 360, Satellite 370, or Cable Modem 380. The EDS card 300 may provide data locally, such as audio data, or may transmit received data to a remote location via an ethernet link such as a 100 Base T LAN link 390 or via DSL 350, Frame Relay 360, Satellite 370, or Cable Modem 380. Data received by the EDS Card 300 may be routed by the IP Multicast Router 310, may be switched through the Broadband Internet Switch 320, or

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may be stored on the High Reliability Solid State File Server 330. The EDS card may be monitored and controlled via the High Reliability Solid State Website 340 which may be accessed via the 100 Base T LAN link 390, DSL 350, Frame Relay 360, Satellite 370, or Cable Modem 380.

- 5 Referring now to Figure 8, the applicants' preferred Internet backchannel system 10 is preferably utilized to distribute Internet content (according to the TCP/IP protocol, which may include UDP packets) onto a remote LAN 12 interconnecting PC's, e.g., 14, 16, on the remote LAN 12. Through the applicants' preferred Internet satellite transmission system 10, content residing on a content server PC 18 is distributed according to the TCP/IP protocol
- 10 through a third-party satellite 20 to the client PC's 14, 16 on the remote Ethernet LAN 12.

In the applicants' preferred system 10, the TCP/IP content flow is as follows:

1. A PC, e.g., 14, on the remote Ethernet LAN 12 is connected to the Internet through a conventional, and typically pre-existing, TCP/IP router 36 in a fashion well known to those skilled in the art. The router 36 can thus send requests for information or
- 15 Internet content through the Internet 38 to a local router 40 to which a content server 18 (perhaps an Internet web server) is connected in a fashion well known to those skilled in the art.
2. The content server 18 outputs the Internet content in TCP/IP Ethernet packets for reception at the serial port (not shown) on a conventional Internet router 22;
- 20 3. The router 22 outputs HDLC encapsulated TCP/IP packets transmitted via RS422 signals at an RS-422 output port (not shown) into an RS-422 service input into a StarGuide(R) MX3 Multiplexer 24, available from StarGuide Digital Networks, Inc., Reno, Nevada. (All further references to StarGuide® equipment refer to the same company as the manufacturer and source of the equipment.) The method of

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multiplexing utilized by the MX3 Multiplexer is disclosed in Australia Patent No. 697851, issued on January 28, 1999, to StarGuide Digital Networks, Inc, and entitled "Dynamic Allocation of Bandwidth for Transmission of an Audio Signal with a Video Signal."

- 5 4. The StarGuide® MX3 Multiplexer 24 aggregates all service inputs into the Multiplexer 24 and outputs a multiplexed TDM (time division multiplexed) data stream through an RS-422 port (not shown) for delivery of the data stream to a modulator 26, such as a Comstream CM701 or Radyne DVB3030, in a manner well known to those skilled in the art. The modulator 26 supports DVB coding
10 (concatenated Viterbi rate $N/(N+1)$ and Reed-Solomon 187/204, QPSK modulation, and RS-422 data output). Multiple LANs (not shown) may also be input to the StarGuide Multiplexer 24 as different services, each connected to a different service input port on the StarGuide Multiplexer 24,
- 15 5. The modulator 26 outputs a 70 MHz RF QPSK or BPSK modulated signal to a satellite uplink and dish antenna 28, which transmits the modulated signal 30 through the satellite 20 to a satellite downlink and dish antenna 31 remote from the uplink 28.
- 20 6. The satellite downlink 31 delivers an L-Band (920-2050MHz) radio frequency (RF) signal through a conventional satellite downlink downconverter to a StarGuide® II Satellite Receiver 32 with the applicants' preferred Ethernet/Router card 34 removably
inserted into one of possibly five available insertion card slots (not shown) in the back side of the StarGuide® II Receiver 32. The StarGuide® II Receiver 32 demodulates and demultiplexes the received transmission, and thus recovers individual service data streams for use by the cards, e.g., EDS Card 34, mounted in the StarGuide® II Receiver 32. The Receiver 32 may also have one or more StarGuide® cards

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including audio card(s), video card(s), relay card(s), or async card(s) inserted in the other four available slots of the Receiver 32 in order to provide services such as audio, video, relay closure data, or asynchronous data streams for other uses or applications of the single receiver 32 while still functioning as a satellite receiver/router as set forth in this specification. For example, other services, available from StarGuide Digital Networks, Inc. of Reno, Nevada that may be added to a receiver include an Asynchronous Services Statistical Demux Interface Module, a Digital Video Decoder Module, an MX3 Digital Multimedia Multiplexer, a Digital Audio Storage Module, and a Digital Multimedia Satellite Receiver.

- 5 7. The EDS Card 34 receives its data and clock from the StarGuide® II Receiver 34, then removes the HDLC encapsulation in the service stream provided to the EDS Card 34 by the StarGuide® II Receiver 32, and thus recovers the original TCP/IP packets in the data stream received from the Receiver 32 (without having to reconstruct the packets). The EDS Card 34 may then, for example, perform address
10 filtering and route the resulting TCP/IP packets out the Ethernet port on the side of the card (facing outwardly from the back of the StarGuide® II Receiver) for connection to an Ethernet LAN for delivery of the TCP/IP packets to addressed PCs, e.g., 14, 16 if addressed, on the LAN in a fashion well to those skilled in the art. Alternatively, as discussed above, the EDS Card 34 may store the received packets on the flash
15 memory storage 114 of Figure 1 for example.

20 As a result, high bandwidth data can quickly move through the preferred satellite system 10 from the content server 18 through the one-way satellite connection 20 to the receiving PC, e.g., 14. Low bandwidth data, such as Internet user requests for web pages, audio, video, etc., may be sent from the remote receiving PC, e.g., 14, through the inherently

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problematic but established Internet infrastructure 38, to the content server 18. Thus, as client PC's, e.g., 14, 16, request data, the preferred system 10 automatically routes the requested data (provided by the content server 12) through the more reliable, higher bandwidth, and more secure (if desired) satellite 20 transmission system to the StarGuide® II Receiver and its associated EDS Card 34 for distribution to the PC's 14, 16 without going through the Internet 38 backbone or other infrastructure.

Referring now to Figure 9, the applicants' preferred intranet system 42 is preferably utilized to distribute TCP/IP formatted content onto a remote LAN 12 interconnecting PC's, e.g., 14, 16, on the remote LAN 12. Through the intranet system 42, content residing on a content server PC 18 is distributed through the intranet 42 to the client PC's 14, 16 through a private telecommunications network 39.

The intranet system 42 of Figure 9 works similarly to the Internet system 10 of Figure 1 except that the intranet system 42 does not provide a backchannel through the Internet 40 and instead relies on conventional telecommunications connections, through conventional modems 44, 46, to provide the backchannel. In the applicants' preferred embodiment the remote LAN modem 44 connects directly to an RS-11 port on the outwardly facing side of EDS Card 34 on the back side of the StarGuide® II Receiver 32 in which the EDS Card 34 is mounted. The Ethernet/Router card 34 routes TCP/IP packets addressed to the head end or content server 18 (or perhaps other machines on the local LAN 19) to an RS232 serial output (113 in Figure 8) to the remote LAN modem 44 for delivery to the content servers or head end 18. Alternatively, the remote modem 44 may be connected to accept and transmit the TCP/IP data and requests from a client PC, e.g., 14, through a router (not shown) on the remote LAN 12, in a manner well known to those skilled in the art.

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The local modem 46 is connected to the content server 18 or to a head-end LAN on which the server 18 resides. The two modems 44, 46 thus provide a TCP/IP backchannel to transfer TCP/IP data and requests from PC's 14, 16 on the remote LAN (which could also be a WAN) 12 to the content server 18.

5 Referring now to Figure 4, the applicants' preferred "muxed" uplink system, generally 48, is redundantly configured. The muxed system 48 is connected to a local or head-end Ethernet LAN 19, to which an Internet Web Server 50 and Internet Multicasting Server 52 are connected in a manner well known to those of skill in the art. Two 10BaseT Ethernet Bridges 53, 55 provide up to 8 mbps (megabits per second) of Ethernet TCP/IP data into
10 RS422 service ports (not shown) mounted in each of two StarGuide® II MX3 Multiplexers 24a, 24b, respectively. The main StarGuide® Multiplexer 24a is connected via its monitor and control (M&C) ports (not shown) through the spare Multiplexer 24b to a 9600 bps RS-232 link 56 to a network management PC 54 running the Starguide Virtual Bandwidth Network Management System (VBNMS).

15 Each of the Multiplexers, e.g., 24a, output up to 8mbps through an RS422 port and compatible connection to an MPEG-DVB modulator, e.g., 58. The modulators, e.g., 58, in turn feed their modulated output to a 1:1 modulator redundancy switch 60 and deliver a modulated RF signal at 70 to 140 MHz for transmission through the satellite (20 in Figure 8). In this regard, the VBNMS running on the network management PC 54 is also connected to
20 the redundancy switch 60 via an M&C RS-232 port (not shown) on the redundancy switch 60.

With reference now to Figure 5, in the applicants' preferred muxed down-link, generally 62, there is no need for a router between the StarGuide® II Satellite Receiver 32 and the remote LAN 12. The Receiver 32 directly outputs the Ethernet encapsulated TCP/IP

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packets from the Ethernet output port (not shown) on the Receiver 32 onto the LAN cabling 12 with no intermediary hardware at all other than standard inexpensive cabling hardware.

The LAN 12 may also be connected to traditional LAN and WAN components, such as local content servers 64, 66, router(s), e.g., 36, and remote access server(s), e.g., 68, in addition to the LAN-based PC's, e.g., 14, 16. In this WAN configuration, yet additional remotely connected PC's 70, 72, may dial-in or be accessed on conventional telecommunications lines, such as POTS lines through a public switching network (PTSN) 71 to procure TCP/IP or other content acquired by the remote access server 68, including TCP/IP content delivered to access server 68 according to addressing to a remotely connected PC, e.g., 70, of packets in the Ethernet data stream output of the Ethernet/Router card (34 in Figure 8).

With reference now to Figure 6, the applicants' preferred clear channel system, generally 74, eliminates the need for both costly multiplexers (e.g., 24 in Figure 4) and the VBNMS and associated PC (54 of Figure 4). The clear channel system 74 is well suited to applications not requiring delivery of multiple services through the system 74. The clear channel system 74 of Figure 6 provides up to 10mbps of Ethernet TCP/IP data directly into the input of an MPEG-DVB modulator, e.g., 58, for uplinking of the frequency modulated data for broadcast through the satellite (20 in Figure 8). (Note that, although these systems employ MPEG-DVB modulators, they do not utilize DVB multiplexers or DVB encrypting schemes.)

Alternatively and with reference now to Figure 7, the bridges 53, 55 may each instead consist of a 100BaseT Ethernet router 53, 55. As a result, these routers 53, 55 preferably may deliver up to 50 mbps HSSI output directly into their respective modulators, e.g., 58.

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Applicants' preferred modulator for this application is a Radyne DM-45 available from Radyne Corporation.

The preferred receiver/router eliminates the need for any special or custom software while providing a powerful, reliable, and flexible system for high speed, asymmetrical
5 distribution of Internet or TCP/IP compatible content, including bandwidth intensive audio, video, or multimedia content, to an Ethernet computer network. This is particularly useful where a digital terrestrial infrastructure is lacking, overburdened, otherwise inadequate, or cost prohibitive.

Although in the above detailed description, the applicants preferred embodiments
10 include Internet or telecommunications backchannels, the above system may utilized to provide high speed audio or video multicasting (via UDP packets and deletion of the backchannel). In this utilization of the applicant's receiver/router in a one-way system from the uplink to the receiver/router, all remote LAN's or other connected computers receive the same data broadcast without any interference to the broadcast such as would be encountered
15 if it were to be sent through the Internet backbone.

Additionally, the EDS Card may be preferably utilized in conjunction with a Transportal 2000 Store-and-Forward System or the StarGuide III Receiver available from StarGuide Digital Networks, Inc., of Reno, Nevada.

Additionally, as illustrated in the flowchart 1100 Figure 11, the present invention may
20 be employed to distribute data or content, for example, audio advertising, from a centralized origination location to a number of geographically diverse receivers. A particular example of such a data distribution system is the distribution of audio advertising, particularly localized audio spots comprising a national advertising campaign. First, at step 1110 content data is originated. For the audio spot example, the audio spots may be recorded at an centralized

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origination location such as a recording studio or an advertising agency. Next, at step 1120, the content data is localized. For the audio spot example, the audio spot is localized by, for example including the call letters of a local receiver or including a reference to the region. Next, at step 1130, the content data is transmitted to and received by a remote receiver. For

5 the audio spot example, the audio spot may be transmitted for geographically diverse broadcast receivers via a satellite data transmission system. Once the content data has been received by the remote receiver, the content data may be stored locally at the receiver step 1140, the content data may be modified at the receiver at step 1150, the content data may be immediately broadcast at step 1160, or the content data may be further transmitted at step

10 1170, via a LAN for example. For the audio spot example, the audio spot may be stored at the receiver, the audio spot may be modified, for example by mixing or cross fading the audio spot with a local audio signal, the audio spot may be immediately broadcast, or the audio spot may be further transmitted via a network such as a LAN or downloaded from the receiver. Finally, at step 1180, a confirmation may optionally be sent to the data origination location.

15 The confirmation may indicate that the content data has been received by the receiver. Additional confirmations may be sent to the data origination location when the content data is broadcast as in step 1160, or further transmitted as in step 1170, for example. For the audio spot example, a confirmation may be sent when the spot is received and additionally when the spot is broadcast or further transmitted, for example. The present invention thus provides

20 a distribution system providing reliable, fast and efficient delivery of content as well as increased automation capability throughout the system. For the audio spot example, increased automation, ease of use and speed of distribution of a national ad campaign to a number of local broadcasters may allow increased broadcast advertising and may draw major advertising expenditures into national broadcasting advertising campaigns.

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While particular elements, embodiments and applications of the present invention have been shown and described, it is understood that the invention is not limited thereto since modifications may be made by those skilled in the art, particularly in light of the foregoing teaching. It is therefore contemplated by the appended claims to cover such modifications and incorporate those features which come within the spirit and scope of the invention.

5

5

APPENDIX A

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EDS Commands

This document describes the Monitor and Control Interface commands for the StarGuide

- 5 Digital EDS plug-in module. As the command list grows or changes this document will be updated. Several commands are considered "debug" commands and can not be accessed unless the debug command is issued with the correct password.

The following list displays the current set of commands on the EDS Card board. This also

- 10 happens to be the output of the HELP command.

15	ADDR	- Addressing Settings
	HELP	- Usage Info
	EO	- EO Port Settings
20	MC	- M&C Config
	REBOOT	- Software Reboot
	STATS	- Board Statistics
25	TIME [, value]	- Calendar Time
	TIME ZONE [,value,name]	- Local timezone
30	DIR [path]	- Show directory
	SCHED	- Current schedule
35	VER	- Software Version

If the unit has is in debug mode the following commands can also be accessed:

- 40 DEBUG COMMANDS:

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	COMMUNITY	- SNMP Community Settings
5	FTP	- Settings for FTP download
	HDLC	- HDLC Settings
10	HOST	- Communicate with Receiver Host
	IGMP	- IGMP Settings
	MR [address] [, length]	- Memory Read
15	MW <address>,<value>[,value,. . .]	- Memory Write
	NV	- Non-volatile Memory Commands
20	RCV	- Receiver Settings
	SYSTEM	- SNMP System Variable Settings
	ADDR	

25

The ADDR command is used to set or query the addressing modes used in the In-Band Control stream. The types of addressing are the same used in the StarGuide II receiver. Because these commands are used primarily for network control purposes, only a limited subset of commands is shown to the user (using ADDR SHOW). The

list of options shown the user is as follows:

30

ADDR SERIAL_NUMBER This form of the command queries the serial number of the ethernet card.

ADDR SHOW This form of the command shows the current address settings.

The ADDR command takes the following forms which can be used for network control:

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ADDR NID[,value]	This form of the command queries or sets the Network ID for the ethernet card.
ADDR LID,<index>[,value] index range 0..15)	This form of the command sets or queries the logical ID settings for the ethernet card.
ADDR SID,<index>[,value](index range 0..15)	This form of the command sets or queries the slot ID settings for the ethernet card.

COMMUNITY

The community command is used to set or query the community strings used by SNMP. This command is a debug command and comes in the following forms:

COMMUNITY PUBLIC To set the public strings used for SNMP GET commands, [, "string", index] the string must be less than 256 characters and the index should be 0 for the string that has access to the entire MIB II database and 1 for the string that only has access to the ICMP portion of the database. The string should be surrounded by double quotes as shown.

COMMUNITY PRIVATE To set the private community string used for SNMP SET commands, [, "string"] the string must be less than 256 characters. The string should be surrounded by double quotes as shown.

COMMUNITY SHOW Shows the current community strings. For example, the following display shows the default values when queried.

>COMMUNITY SHOW

PUBLIC:

[0] public

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[1] icmp

PRIVATE:

private

DEBUG

The DEBUG command is used to enable various debug modes on the ethernet card.

If the debug mode has not been turned on then all of the following commands will

5 return an ERROR response (except: DEBUG SDN which turns debug mode on). The following forms of the command are used:

DEBUG SDN Turns the debug mode on.

DEBUG OFF Turns all debug modes off.

DEBUG Show the current setting for the debug modes.

SHOW

DIR

The DIR command is used to display the contents of the Flash Memory Storage of the

EDS Card card. This command takes an optional parameter that is the pathname on

10 the drive to list the contents of. If no path is given the root directory is assumed. The forms of the DIR command are shown below:

A sample display from a DIR command is shown below:

>dir

MON DEC 31 98220 TestAudioSpot

17:00:00 1979 TEXT.MP2

MON DEC 31 486912 MyAudio

17:00:00 1979 SPOT.MP2

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MON DEC 31		969
17:00:00 1979		DEFAULT.H
		TM
MON DEC 31		135
17:00:00 1979		TEST.HTM
MON DEC 31		112640
17:00:00 1979		TEST.TXT
MON DEC 31	DIR	TEMP
17:00:00 1979		
TUE OCT 19		5120
14:21:12 1999		NVRAM.BA
		K
TUE SEP 07		997
09:27:50 1999		TITLES.OLD
MON DEC 31		719
17:00:00 1979		PACKAGE.H
		TM
WED OCT 20		874
18:19:10		TITLES.BAK
THU AUG 26		599729
19:22:32 1999		TEST.JPG
MON DEC 31		32646
17:00:00 1979		LOGO.GIF
MON DEC 31		349

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17:00:00 1979	AUDIO.GIF	
MON DEC 31	324	
17:00:00 1979	DATA.GIF	
MON DEC 31	417	
17:00:00 1979	IMAGE.GIF	
MON DEC 31	398	
17:00:00 1979	PACKAGE.G	
	IF	
MON DEC 31	324	
17:00:00 1979	PROG.FIG	
MON DEC 31	336 TXT.GIF	
17:00:00 1979		
MON DEC 31	323	
17:00:00 1979	VIDEO.GIF	
MON DEC 31	1909	
17:00:00 1979	SEARCH.HT	
	M	
TUE OCT 19	5120	
14:21:14 1999	NVRAM.CF	
	G	
WED OCT 20	874	
18:19:26 1999	TITLES.CFG	
TUE OCT 19	2748	MXPRESS.COM
14:37:52 1999	003ED757.____	Notes 1999/10/18

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TUE OCT 19	1673	T2000 SILENCE
14:37:56 1999	003ED758. __	IS GOLDEN
TUE OCT 19	5955	MXPRESS
14:38:02 1999	003ED759. __	LOGO
TUE OCT 19	717	NAVYBLUE
14:40:44 1999	003ED766. __	ABC Predemo
TUE OCT 19	290592	test
14:41:12 1999	003ED767. __	ANTONIO
TUE OCT 19	298881	BANDERAS
14:41:44 1999	003ED768. __	MAGAZINES
TUE OCT 19	189	TEST
14:41:52 1999	003ED769. __	LOGO
TUE OCT 19	17726	LOGO
14:41:58 1999	003ED76A	
WED OCT 20	2734	94470
16:09:36 1999	003ED76D. __	

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WED OCT 20	691	MORE FROM
16:09:42 1999	003ED76E.____	THE FAQ
	-	
WED OCT 20	849	8582
16:10:36 1999	003ED76B.____	
	-	
WED OCT 20	188352	JEWEL ON
16:10:54 1999	003ED76C.____	WHY
	-	
MON DEC 31	1430	
17:00:00 1979	SCHED.HTM	
MON DEC 31	919	
17:00:00 1979	CONFIG.HT	
	M	
MON DEC 31	911	
17:00:00 1979	HELP.HTM	
WED OCT 20	2749	94471
18:19:08 1999	003ED77D.____	
	-	
WED OCT 20	1312	HOW DO I
18:19:12 1999	003ED773.____	TRACK A
	-	PACKAGE
MON DEC 31	1263	
17:00:00 1979	NEW.GIF	

39 files, 2169026 bytes used, 145313792 bytes free

E0

The E0 command (formerly the IP command) is used to configure or monitor the ethernet port (E0) of the card. This command has several sub-commands that can be used to

- 5 configure the card's behavior to packets being transferred from the HDLC port to the ethernet port. The configuration of these parameters can only be made if the unit is in debug mode.

E0 IP_ALLOW[,address.mask] Queries or sets the addresses allowed to pass to the ethernet port. Up to 8 address.mask pairs can be entered. If the unit is not in debug mode, this sub command can only be queried.

E0 IP_ALLOW,<ANY,NONE> The ANY option allows all IP destination addresses to be passed from the HDLC port to the ethernet port. the NONE option will prevent all IP packets from being passed from the HDLC port to the ethernet port.

E0 IP_ADDR[,addr] This command sets or queries the IP address of the ethernet interface. After and changes have been made the REBOOT command must be issued for the new changes to take effect.

E0 IP_SUBNETMASE[,addr] This command sets or queries the IP address subnet mask of the ethernet interface. After and changes have been made the REBOOT command must be issued for the new changes to take affect.

E0 IP_GATEWAY[,addr] This command sets or queries the IP address of the ethernet interface's default gateway. Any commands

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coming through the HDCL port to addresses that can not be resolved locally are forwarded to the default gateway. After and changes have been made the REBOOT command must be issued for the new changes to take affect.

- E0 IP_ALIAS_ADDR[,addr] This command sets or queries the IP alias address of the ethernet interface.
- E0 IP_ALIAS_ADDR,DELETE This command deletes the IP alias address of the ethernet interface. The alias is a secondary IP address for the ethernet interface.
- E0 IP_ALIAS_NETMASK[,mask] This command sets or queries the IP alias netmask of the ethernet interface.
- E0 SHOW Display the current settings for the ethernet interface.

FTP

- The FTP command is protected by the debug password. The FTP command is used to setup and initiate an FTP software download to flash memory. The items that need to be set prior to initiating an FTP download are the FTP server IP address, the username, and user password in order to access the FTP server. These settings are stored in non-volatile memory.

- FTP IP_ADDR[,address] Sets the IP address of the FTP server.
- FTP USER[,string] This is the user string used to log into the FTP server.
- FTP PASSWORD[,string] This is the password used to log onto the FTP server.
- FTP GET,filename This command initiates a download of the file specified. Make sure that the filename includes the entire path to the

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file. For example `"/incoming/v0013.ftp"`. The FTP process will report status indicators indicating progress of the download. A "." will be printed on every download block to indicate that the download is in process.

FTP GET_RCV,filename This command initiates a download of the file specified for the StarGuide Receiver. The downloaded file is sent through the AUXI port to the receiver. Make sure that the filename includes the entire path to the file. For example `"/incoming/v0013.ftp"`. The FTP process will report status indicators indicating progress of the download. A "." will be printed on every download block to indicate the download is in process.

FTP GET
RCV.filename.HIF This command initiates a download of the file specified for the StarGuide Receiver. The downloaded file is sent through the host interface port to the receiver rather than the AUXI port. In order for this type of download to work, the receiver must have the correct host interface code (Clear Channel Code V1.16 or later or CP Code V3.72 or later). Make sure that the filename includes the entire path to the file. For example `"/incoming/v0013.ftp"`. The FTP process will report status indicators indicating progress of the download. A "." will be printed on every download block to indicate that the download is in process.

FTP SHOW Display the FTP parameters. The output is shown below.

- 50 -

FTP SHOW

IP_ADDR: 192.168.3.168

USER: grasche

PASSWORD: newguy

5 HOST

The HOST command is protected by the debug password. The HOST command allows the user to communicate to the host receiver. There are two communication paths available to communicate with the receiver: internally through the host interface or externally through a cable from the AUXI port of the ethernet card to the M&C port of the receiver. The first option, internal communication, requires the clear channel receiver code V1.16 or hither. The second option works with any version of receiver code but does require an external cable. The two forms of the HOST command are shown below.

10 HOST string This command sends the string specified to the receiver through the internal host interface. Note that the string represents a command to the receiver and as such MUST be in capital letters. If the string contains a comma then it MUST be surrounded by double quote (") characters.

HOST AUXI,string This command sends the string specified to the receiver through the external AUXI connector. Note that the string represents a command to the receiver and as such MUST be in capital letters. If the string contains a comma then it MUST be surrounded by double quote (") characters.

HDLC

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The HDLC command is protected by the debug password. The HDLC command controls the incoming data from the StarGuide II receiver. The data is received over the receiver backplane. The data is ethernet data packets encapsulated in an HDLC stream. One of the other parameters of the HDLC command is the IBS channel IP address and port number. This address (along with the associated port) determines which packets are designated as "in-band signaling".

5 HDLC DEBUG_LEVEL[,0|1|2] Sets the debug level for the HDLC processing block.

HDLC DRV_DEBUG[,TRUE|FALSE] Sets the HDLC software driver debug level.

HDLC ENABLE[,TRUE|FALSE] Enables the reception of data from the receiver.

HDLC IBS_IP_ADDR[,value]- Set the In-Band Control Channel IP address.

HDLC IBS_UDP_PORT[,value] - Sets the port used for the IBS stream.

(1..8000)

HDLC STATISTICS_CLEAR Clears all HDLC statistics.

HDLC SHOW Display HDLC parameters and counters.

>HDLC SHOW

10 debugLevel 0

drvDebug FALSE

enable TRUE

config.ibsIpAddr 239.255.0.1 (0Xefff0001)

config.ibsUdpPort 2002

isrCount 0

Glitch on RX 0

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	Flag Status	0
	Rx Frame	0
	Busy Condition	0
	Rx Buffer	0
5	Rx DPLL Error	0
	Rx Length Error	0
	Rx Nonalign Frame	0
	Rx Abort	0
	Rx CRC Error	0
10	Rx Overrun	0
	discardFrameCnt	0
	crcErrprCnt	0
	abortErrorCnt	0
	ifaceErrorCnt	0

15 The values of the counters increase as IP traffic is received from the SGII receiver.

IGMP

The IGMP command is also hidden behind the debug password. The IGMP command is used to configure the ethernet card's behavior in the presence of an IGMP network. This commands options are shown below.

IGMP	Enables the debug mode of the
DEBUG[,TRUE FALSE]	IGMP process.
IGMP	Enables the card's IGMP
ENABLE[,TRUE FALSE]	handling.
IGMP	In IGMP mode, this command

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QUERIER_ENABLE[,TRUE FALSE]		enables the card's query mode.
IGMP	-(100..2500)	Sets the query interval in query mode (1/10 of second)
QUERY_INTERVAL[,value]		
IGMP QUERY RESPONSE	-(10..255)	Sets the response timeout value (in 1/10 of a second).
INTERVAL[,value]		
IGMP	-	Base address of the IGMP address block.
IP_ADDR_BASE[,value]	(0xE0000000..0xFEFFFFFF)	
IGMP	-	Sets the mask for the block which determines the size of the address block.
IP_ADDR_MASK[,value]	(0xFFFF0000..0xFFFFFFF)	
IGMP		Query if a particular IP address is joined or not.
GROUP_MEMBER,<ip_addr>		
IGMP SHOW		Display the IGMP settings. The response is shown below.

IGMP SHOW

5	debug	TRUE
	querier	TRUE
	enable	TRUE
	querierEnable	TRUE
	queryInterval	600 (1/10 seconds)
	queryResponseInterval	100 (1/10 seconds)
	ipAddrBase	239.255.0.0 (0xEFFF0000)

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ipAddrMask 0xFFFF0000

MC

The MC command is used to set the parameters of the monitor and control RS-232 interface. Currently only the band rate can be set although the parity, data bits, and stop bits will be added to this command in the future.

MC LOGMSG,<TRUE|FALSE>

MC TTY_BAUD_RATE,<value> Set the baud rate to the specified setting.
(range 9600..38400)

MC SHOW Displays the current settings for the M&C port.

PING

The PING command is used to check Ethernet connectivity from the EDS Card card to another IP based device. The PING command will send out an ICMP echo request message to the specified IP address. The command will display the results of the ping messages (either success or failure). If the pings are successful, time results will be displayed. The PING command comes in the following forms:

PING ipAddress<,numPings> Where the ipAddress can either be a dot notation address or a hex number and the numPings represents the number of pings to send. The numPings must be greater than 0. The following results show a successful ping followed by an unsuccessful ping.

>ping 192.168.3.1

taskSpawn ok

>PING 192.168.3.1: 56 data bytes

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64 bytes from sd-firewall.starguidedigital.com (192.168.3.1) : icmp_seq=0.

time=4. ms

64 bytes from sd-firewall.starguidedigital.com (192.168.3.1) : icmp_seq=1.

time=2. ms

5 64 bytes from sd-firewall.starguidedigital.com (192.168.3.1) : icmp_seq=2.

time=2. ms

----192.168.3.1 PING Statistics----

3 packets transmitted, 3 packets received, 0% packet loss

round-trip (ms) min/avg/max = 2/2/4

10

>ping 100.1.1.1

taskSpawn ok

15 >PING 100.1.1.1: 56 data bytes

no answer from 100.1.1.1

NV

The NV command is a debug command. The NV command is used to access or display various non-volatile memory locations or structures. Currently it is used to store an event log so all of the options of the command revolve around the log. In the future this command may be converted to a LOG command with various options.

20

NV DB_CLEAR Clears the entire non-volatile
memory database.

NV LOG_CLEAR Clears the event log.

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NVLOG_SHOW[,index] Displays the contents of the event log.

RCV

The RCV command is used to configure or query critical parameters of the receiver.

This command communicates with the receiver via the internet host interface. Thus,

5 the receiver must be running Clear Channel Code Version 1.16 code or newer.

The following list shows the options available with the RCV command. Each

command option indicates a command that is sent to the receiver. For details on any

of the receiver commands, see the StarGuide 11 User's Manual.

10 RCV RF[,frequency] - (920000..2050000) The RF queries or sets the
 receiver's L-Band frequency in kHz. Valid
 values are shown in parentheses.

RCV DR[,data_rate] - (512000..8192000) The DR queries or sets the receiver's data rate
 in bits per second. Valid values are shown in
 parentheses.

15 RCV VR[,viterbi_rate] - (3..4) The VR command sets or queries the Viterbi
 decoder rate of the receiver. Valid values are
 shown in parentheses.

RCV CLR[,clr_mode] - (0..1) The CLR command sets or queries the Clear
 Channel Mode of the receiver. Valid values
 are shown in parentheses.

20 RCV EB The EB command queries the current Eb/No
 reading of the receiver in 10ths of a dB. The
 higher the number, the better the signal
 strength.

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RCV AG

5

The AG command queries the current AGC reading on the receiver. The higher this value is the less input signal level there is at the input of the receiver. This value ranges from 0 to 255 and should be kept as near to 128 as possible when configuring the receiver.

RCV SS

10

The SS queries the current status of the receiver. This value represents a sum of the individual status bits currently active. A value of 0 indicates no errors are currently active. See the StarGuide II User's manual for the bitmap values.

RCV SF

15

The SF queries the fault history of the receiver. This value represents a sum of the individual status bits that have been activated since the last time they were cleared (using the SF 0 command through either the HOST or HOST AUX1 commands). A value of 0 indicates no faults have occurred. See the StarGuide II User's manual for the bitmap values.

20

RCV REV

The REV command queries the current software version running in the receiver. This

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command shows the code versions of the motherboard, the demodulator, and the DSP code.

RCV SHOW

5

The RCV SHOW command displays the current values of the receiver parameters that are queried. A parameter is queried every 2 seconds and the parameters are queried sequentially. The output of this command looks something like the following.

10 >rev show

RF: 985000

DR: 6144000

VR: 3

CLR: 1

15 EB: 7.0

AG: 127

SS: 0x00000000

SF: 0x00000000

REV: 1.16,8,160

20 REBOOT

The REBOOT command is used to perform a soft boot. The command comes in one form:

REBOOT <arg> Where *arg* can be either

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0: This type of boot causes the system to go through the normal bootup sequence but memory is not cleared.

1: This type of boot causes the reboot to pause at the boot prompt so the user can change any boot parameters. Memory is not cleared in this type of boot.

2: This performs a normal boot but memory is cleared.

This is the default if *arg* is not specified.

SCHED

The SCHED command is used to display the scheduler's current scheduled events.

10 The command comes in the following forms:

SCHED SHOW Displays the currently active schedules, if any.

SCHED PURGE Delete any existing schedule.

SCHED ADD,dT,rly,fid0[,find] Add an event to the schedule.

15 The dT parameter indicates an event window time in which the relay specified by rly must occur. If the relay is activated during the active window then the file or files specified by the fid0 through fidN parameters are played from the flash memory disk. If multiple files are specified they are played back to
20 back starting from the first file through the last file.

STATS

The STATS command is used to display various bandwidth statistics kept on the board. The statistics include both the ethernet port and the hdlc port.

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STATS_CLEAR Clears the statistics.

STATS SHOW Shows the current statistics. An example of the parameters displayed are shown below. The statistics are kept from the last time they were cleared. The bandwidth statistics show the average bandwidth over the last 5 seconds.

5

>STATS SHOW

SATELLITE INTERFACE (s0)

10 10 packets received; 0 packets sent
0 input errors; 0 output errors
1065 bytes received
604 bps (average bandwidth) received

15 Average satellite packet size is 106

ETHERNET INTERFACE (e0)

625 packets received; 439 packets sent
0 input errors; 0 output errors
20 600 collisions
3 packets routed from s0
649 bytes routed from s0
462 bps (average bandwidth) routed from s0

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Average packet size routed from s0 is 283

236 seconds since the statistics were cleared

SYSTEM

The system command is used to set or query the SNMP system table strings. This
5 command is a debug command and comes in the following forms:

SYSTEM CONTACT[,"string"] To set the contact string, the string must be less than
256 characters. The string should be surrounded by
double quotes as shown.

SYSTEM LOCATION[,"string"] To set the location string, the string must be less than
256 characters. The string should be surrounded by
double quotes as shown.

SYSTEM DESC[,INIT] This command can either query the current SNMP
description string or re-initialize it. The re-
initialization is only needed once after upgrading the
code from versions 5-7 to version 8 or newer because
the format of the string saved in flash memory was
changed. If this is not done the description in the
SNMP will indicate both the previous software
version AND the new one.

SYSTEM SHOW Display the current settings for the SNMP System
tables. The output of this command is shown below
with the card's default strings.

>SYSTEM SHOW

LOCATION:

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San Diego, CA 92121 (619)452-4920

CONTACT:

Starguide Digital Networks

TIME

- 5 The time command is used to set or query the system time. The StarGuide receiver will set the time based on the network timestamp. An example of the query response is shown below.

940542936.THU OCT 21 14:55:36 1999 PDT (GMT-7)

- 10 The time command can also be used to set the current time zone for the EDS Card card since the time is sent in GMT.

VER

- 15 The VER command is used to query the current software version. The query response includes the software version, the date and the time the code was built. An example of a query is shown below.

0.0.2.Jan 22 1997, 16:35:50

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CLAIMS:

1. A satellite transmission reception system including:
a downlink receiver for receiving signals from a satellite, said downlink including an
5 integrated satellite receiver and router,
wherein said signals are stored as files in said integrated satellite receiver and router
for later further transmission.
2. The satellite transmission reception system of claim 1 wherein said integrated
10 satellite receiver and router further includes an Ethernet transceiver for transmitting at least
some of said signals.
3. The satellite transmission reception system of claim 1 wherein said integrated
satellite receiver and router further includes a multicasting processor to provide multicasting
15 of at least some of said signal.
4. The satellite transmission reception system of claim 1 wherein said integrated
satellite receiver and router further includes an HTTP server for communicating with said
EDS card via a web browser.
20
5. The satellite transmission reception system of claim 1 wherein said integrated
satellite receiver and router further includes a DNS resolver for translating mnemonic IP
addresses into numerical IP addresses and vice versa.

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6. The satellite transmission reception system of claim 1 wherein said integrated satellite receiver and router further includes a DHCP processor for dynamically configuring the IP address of said integrated satellite receiver and router.

5 7. The satellite transmission reception system of claim 1 wherein said integrated satellite receiver and router further includes a confirmation web client for sending confirmations to a remote location when predetermined events occur.

8. The satellite transmission reception system of claim 1 wherein said integrated
10 satellite receiver and router further includes an audio subsystem for combining a received audio signal with locally inserted audio signals.

9. The satellite transmission reception system of claim 1 wherein said integrated satellite receiver and router further includes a command processor performing at least one of
15 displaying said at least a portion of a received signal stored in said integrated satellite receiver and router and prompting said integrates satellite receiver and router to transmit said received signals.

10. A satellite data delivery system including:
20 a satellite transmitting signals; and
a downlink receiver for receiving signals from a satellite, said downlink including an integrated satellite receiver and router,
wherein said signals are TCP/IP packets and said TCP/IP packets are routed by said integrated satellite receiver and router. and

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wherein said signals may be stored as files in said integrated satellite receiver and router for later further transmission.

11. The satellite transmission reception system of claim 10 wherein said integrated
5 satellite receiver and router further includes an Ethernet transceiver for transmitting at least some of said signals.

12. The satellite transmission reception system of claim 10 wherein said integrated
satellite receiver and router further includes a multicasting processor to provide multicasting
10 of at least some of said signal.

13. The satellite transmission reception system of claim 10 wherein said integrated
satellite receiver and router further includes an HTTP server for communicating with said
EDS card via a web browser.

15
14. The satellite transmission reception system of claim 10 wherein said integrated
satellite receiver and router further includes a DNS resolver for translating mnemonic IP
addresses into numerical IP addresses and vice versa.

20 15. The satellite transmission reception system of claim 10 wherein said integrated
satellite receiver and router further includes a DHCP processor for dynamically configuring
the IP address of said integrated satellite receiver and router.

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16. The satellite transmission reception system of claim 10 wherein said integrated satellite receiver and router further includes a confirmation web client for sending confirmations to a remote location when predetermined events occur.

5 17. The satellite transmission reception system of claim 10 wherein said integrated satellite receiver and router further includes an audio subsystem for combining a received audio signal with locally inserted audio signals.

10 18. The satellite transmission reception system of claim 10 wherein said integrated satellite receiver and router further includes a command processor performing at least one of displaying said at least a portion of a received signal stored in said integrated satellite receiver and router and prompting said integrates satellite receiver and router to transmit said received signals.

15 19. A TCP/IP compatible satellite transmission system including:
a multiplexer receiving, multiplexing, and outputting multiplexed TCP/IP packets without separating said packets;
an uplink for transmitting said multiplexed TCP/IP packets to a satellite;
a satellite for receiving said multiplexed TCP/IP packets from said uplink and
20 transmitting said TCP/IP packets to a downlink;
a downlink for receiving said TCP/IP packets and transmitting said TCP/IP packets to an integrated satellite receiver and router; and
an integrated satellite receiver and router receiving said TCP/IP packets and demultiplexing and outputting said TCP/IP packets without reconstructing said packets.

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20. An integrated satellite receiver and router including:
a satellite receiver for receiving files;
5 an Ethernet-capable router for routing said files; and
an HTTP server for communicating with said receiver and router via a web browser.

21. The integrated satellite receiver and router of claim 20 further including a
flash memory storage for storing said files.

10

22. The integrated satellite receiver and router of claim 20 further including a
command processor performing at least one of displaying said files stored in said flash
memory storage and prompting said router to route said files.

15 23. The integrated satellite receiver and router of claim 20 further including an
IGMP multicasting processor for multicasting of a received data stream

24. The integrated satellite receiver and router of claim 20 further including a
DNS resolver for translating mnemonic IP addresses into numerical IP addresses and vice
20 versa.

25. The integrated satellite receiver and router of claim 20 further including a
DHCP processor for dynamically configuring the IP address of said integrated satellite
receiver and router.

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26. An Ethernet Digital Storage (EDS) Card for use in a satellite data stream reception system including:

- 5 a flash memory storage for storing at least a portion of a received data stream; and
an Ethernet transceiver for transmitting at least a portion of a received data stream.

27. The EDS card of claim 26 further including a multicasting processor to provide multicasting of at least a portion of said received data stream.

10 28. The EDS card of claim 26 further including an HTTP server for communicating with said EDS card via a web browser.

29. The EDS card of claim 26 further including a DNS resolver for translating mnemonic IP addresses into numerical IP addresses and vice versa.

15 30. The EDS card of claim 26 further including a DHCP processor for dynamically configuring the IP address of said integrated satellite receiver and router.

31. The EDS card of claim 26 further including a confirmation web client for
20 sending confirmations to a remote location when predetermined events occur.

32. The EDS card of claim 26 further including an audio subsystem for combining a received audio data stream with locally inserted audio.

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33. The EDS card of claim 26 further including a command processor performing at least one of displaying said at least a portion of a received data stream stored in said flash memory storage and prompting said Ethernet transceiver to transmit said at least a portion of a received data stream.

5

34. A method for audio advertising distribution comprising the step of:
originating an audio advertising spot at a central location;
localizing said audio advertising spot; and
transmitting said audio advertising spot to a remote receiver via a satellite distribution
10 system.

35. The method of claim 34 further comprising the step of storing said audio advertising spot at said receiver.

15 36. The method of claim 34 further comprising the step of modifying said audio advertising spot at said receiver.

37. The method of claim 34 further comprising the step of immediately
broadcasting said audio advertising spot at said receiver.

20

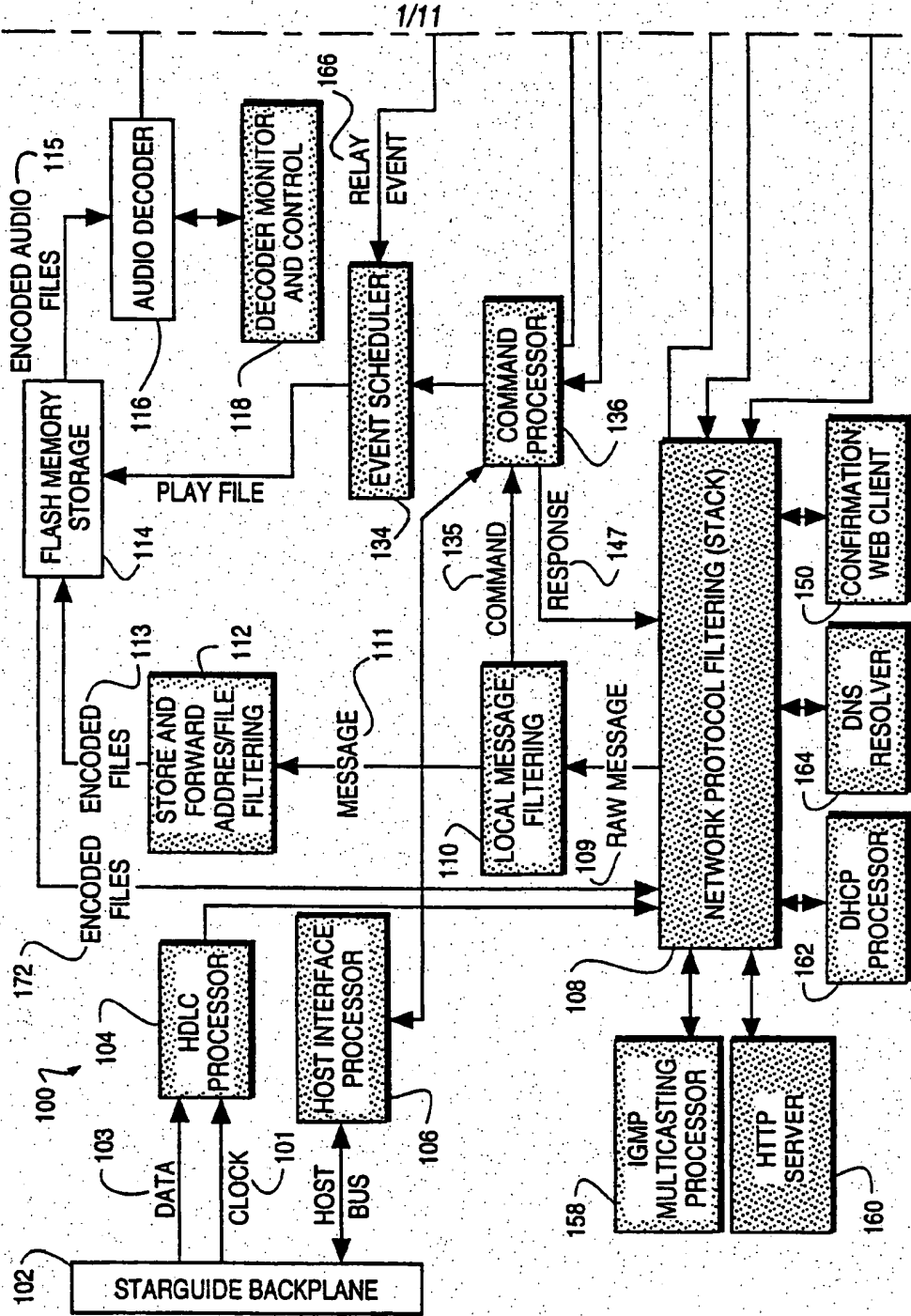
38. The method of claim 34 further comprising the step of further transmitting
said audio advertising spot

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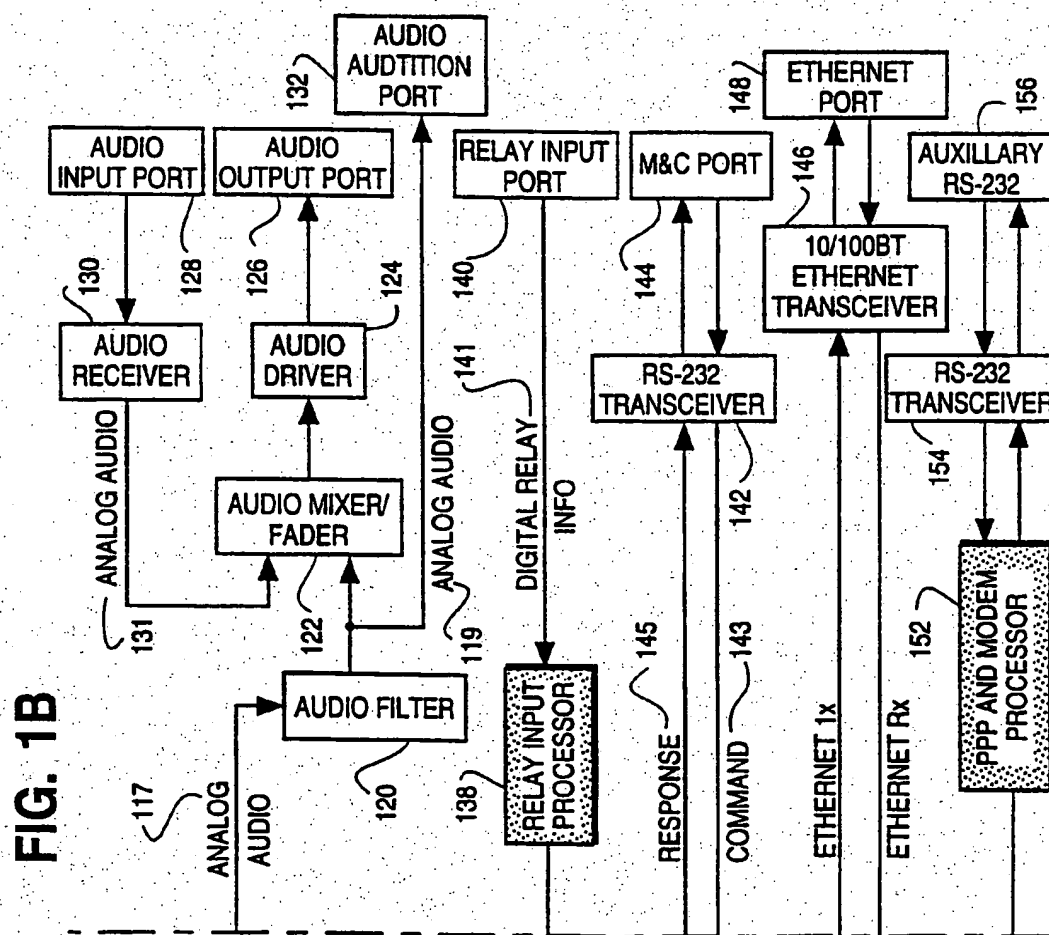
39. The method of claim 34 further comprising the step of sending a confirmation to said data origination location.

FIG. 1

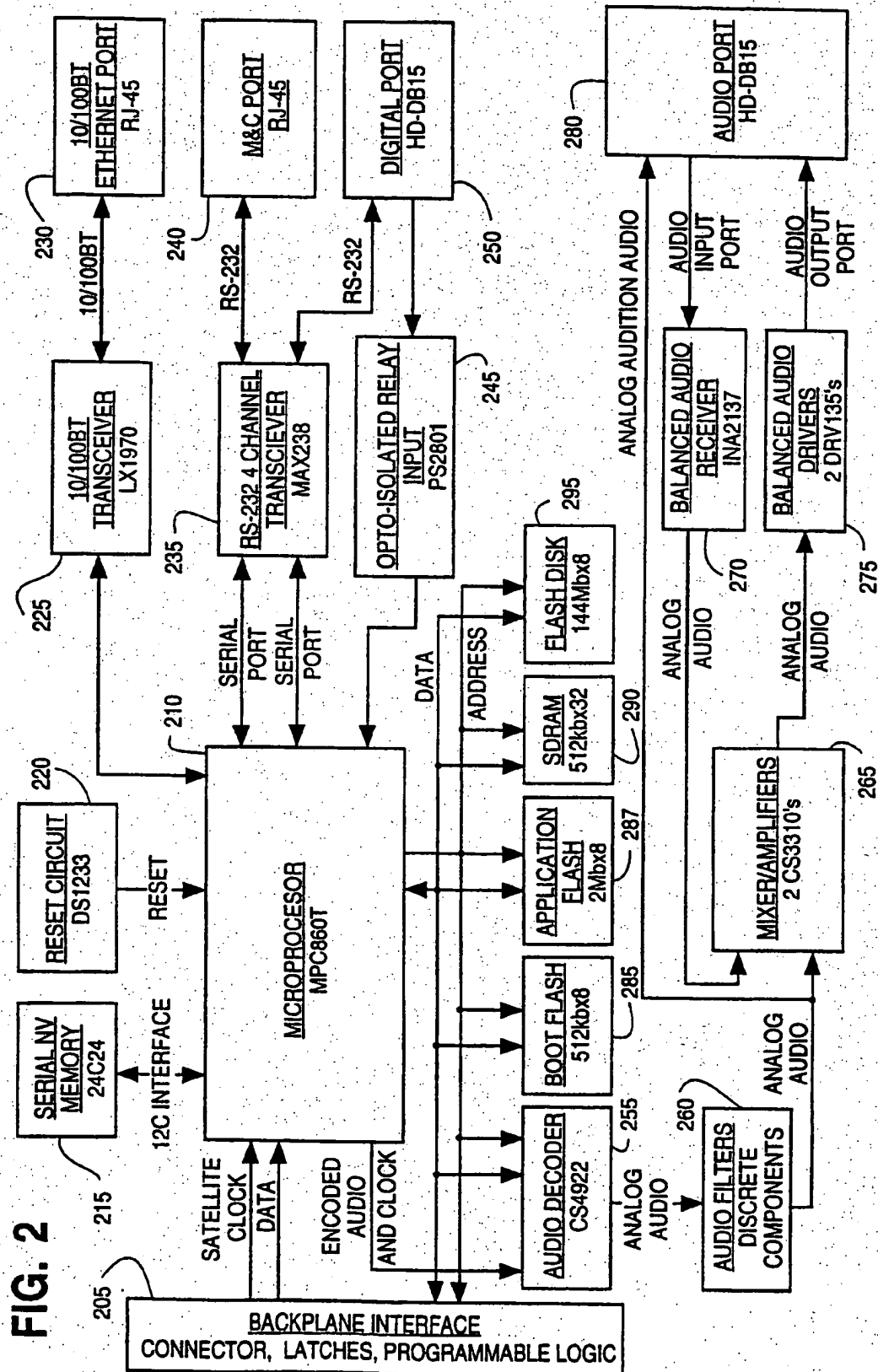
FIG. 1A



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FIG. 3

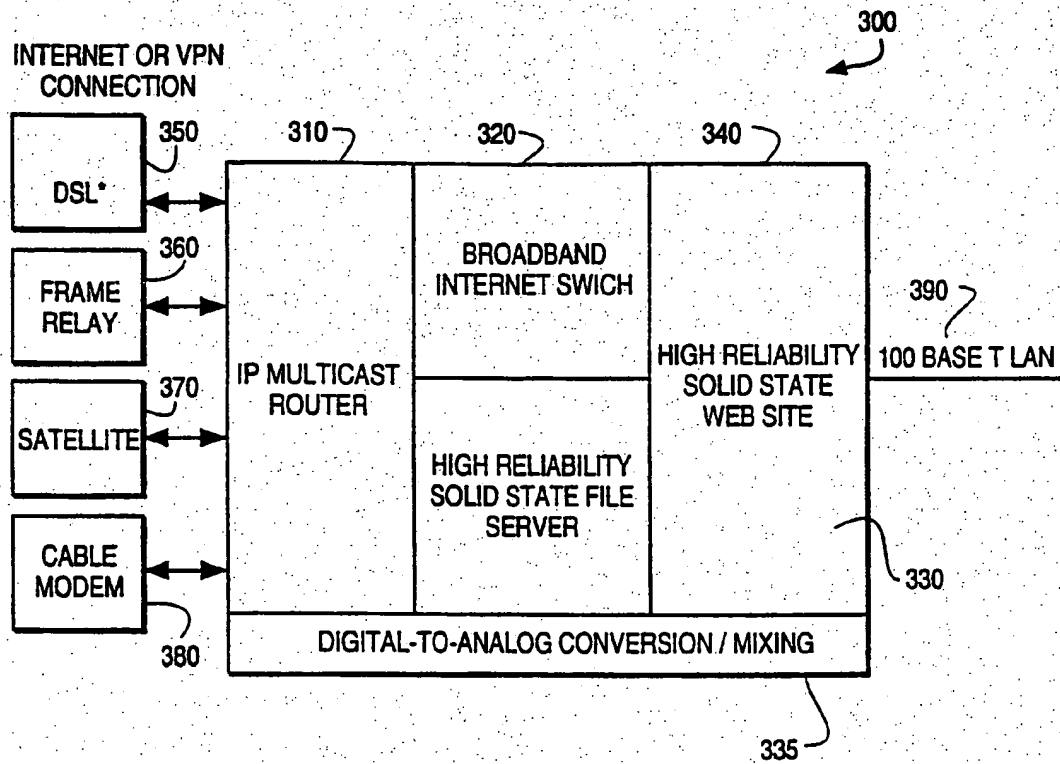
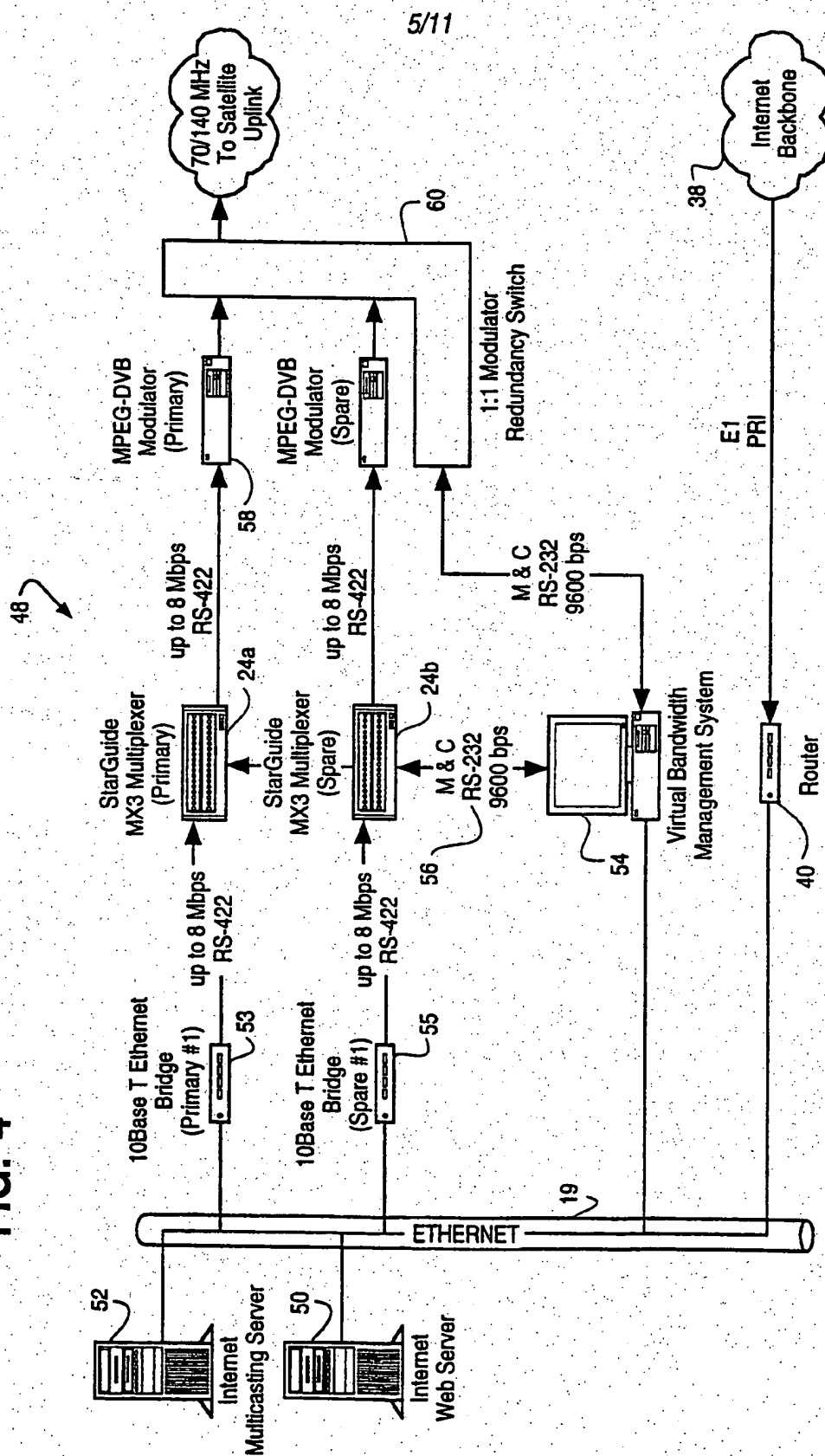


FIG. 4



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FIG. 5

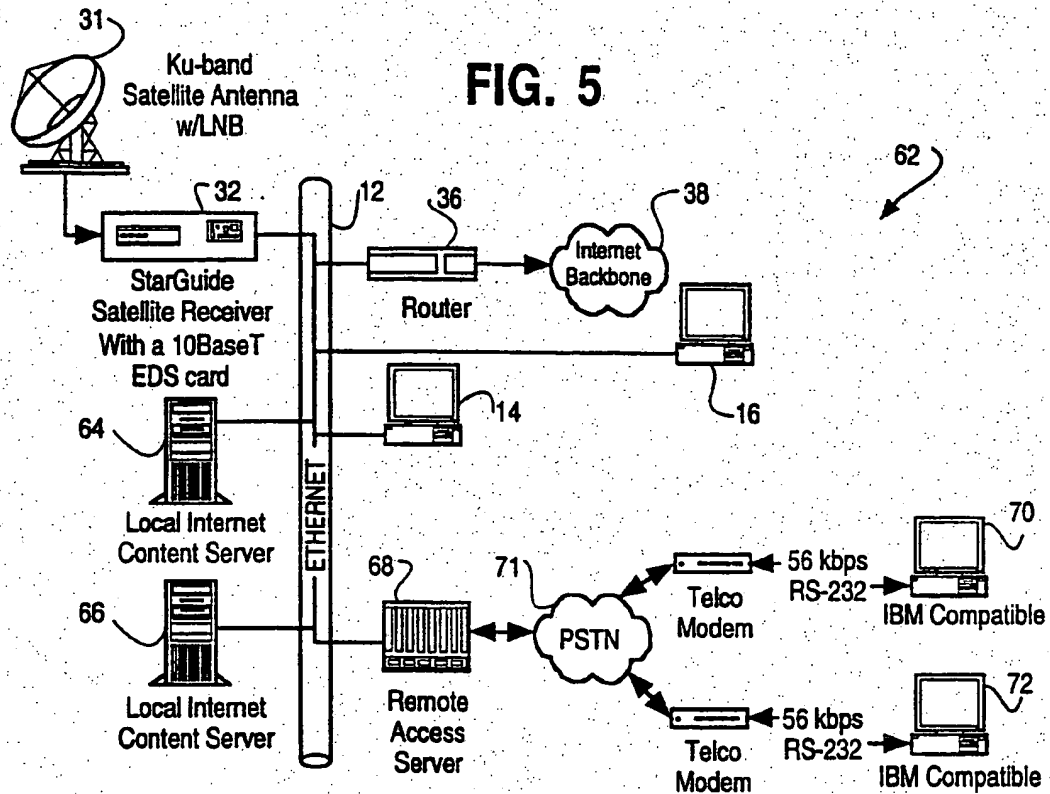
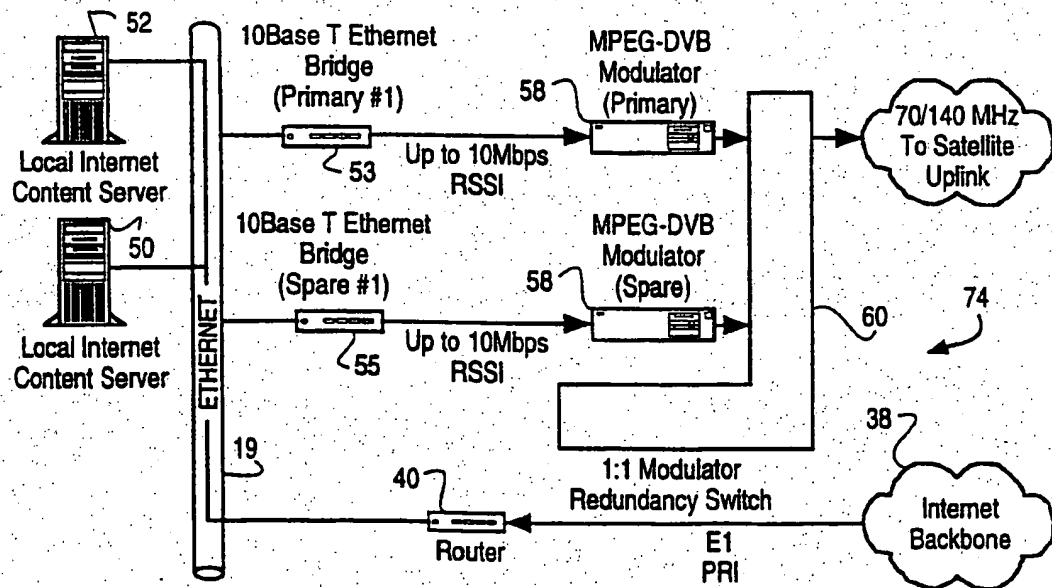
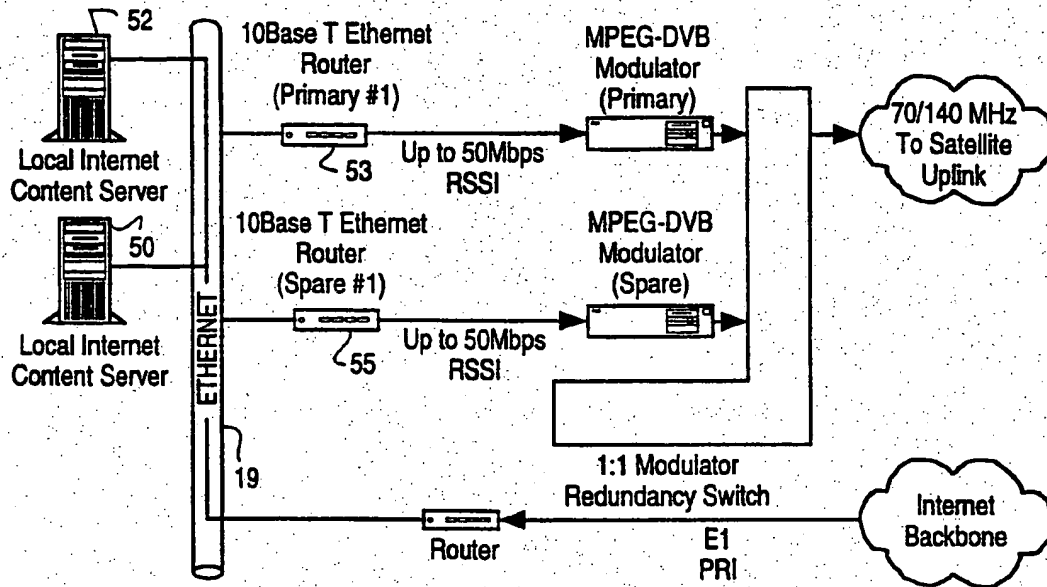


FIG. 6

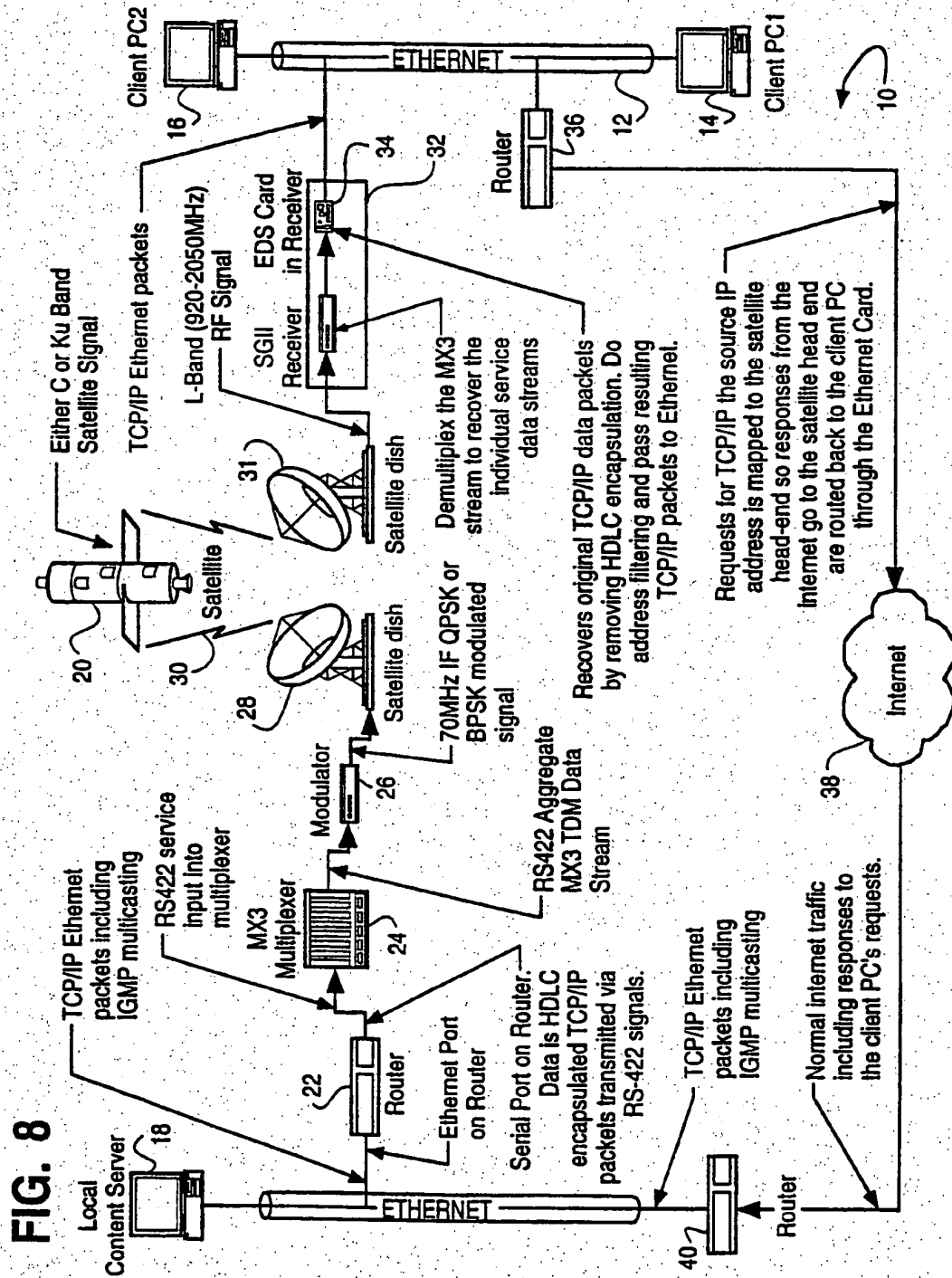


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FIG. 7

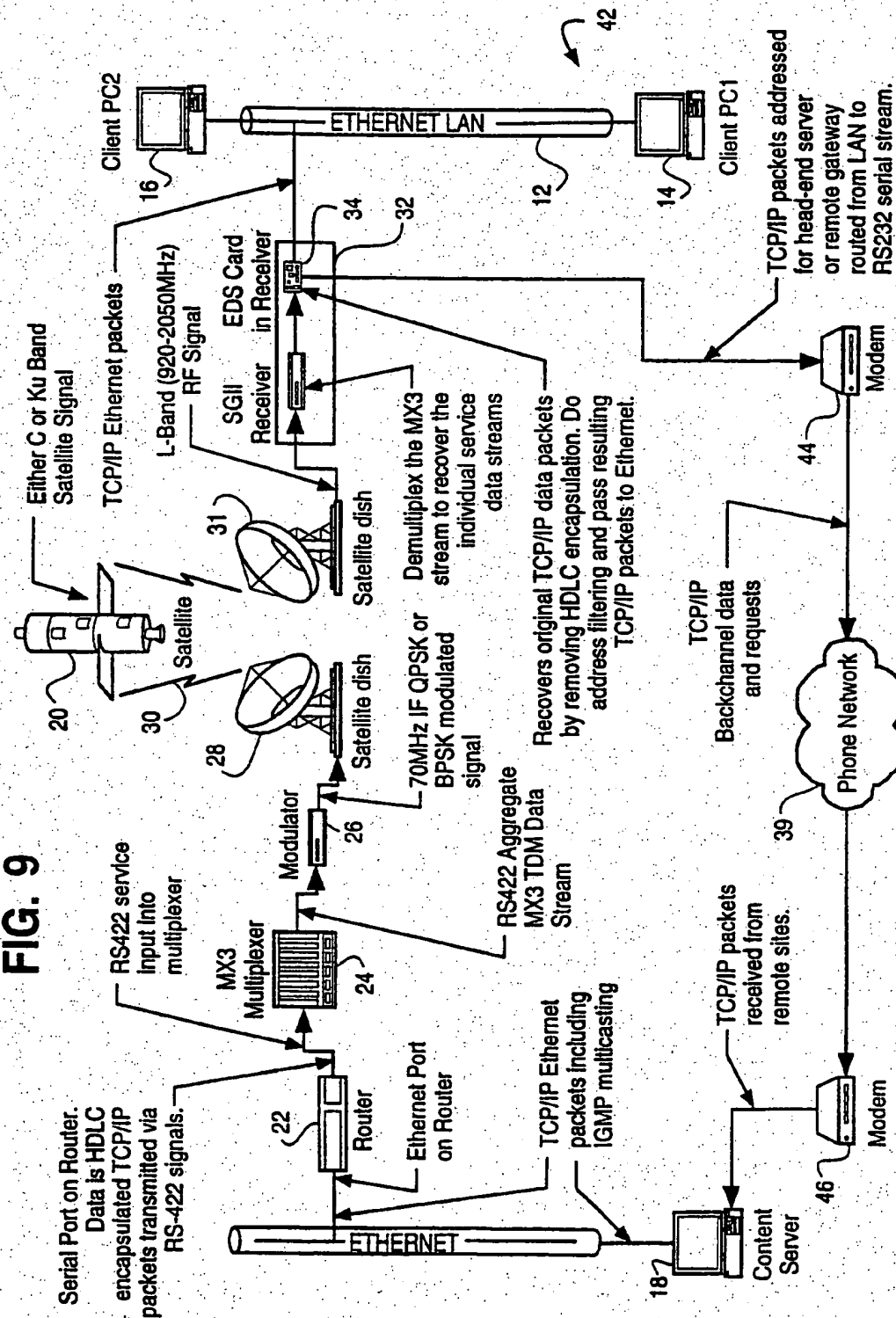


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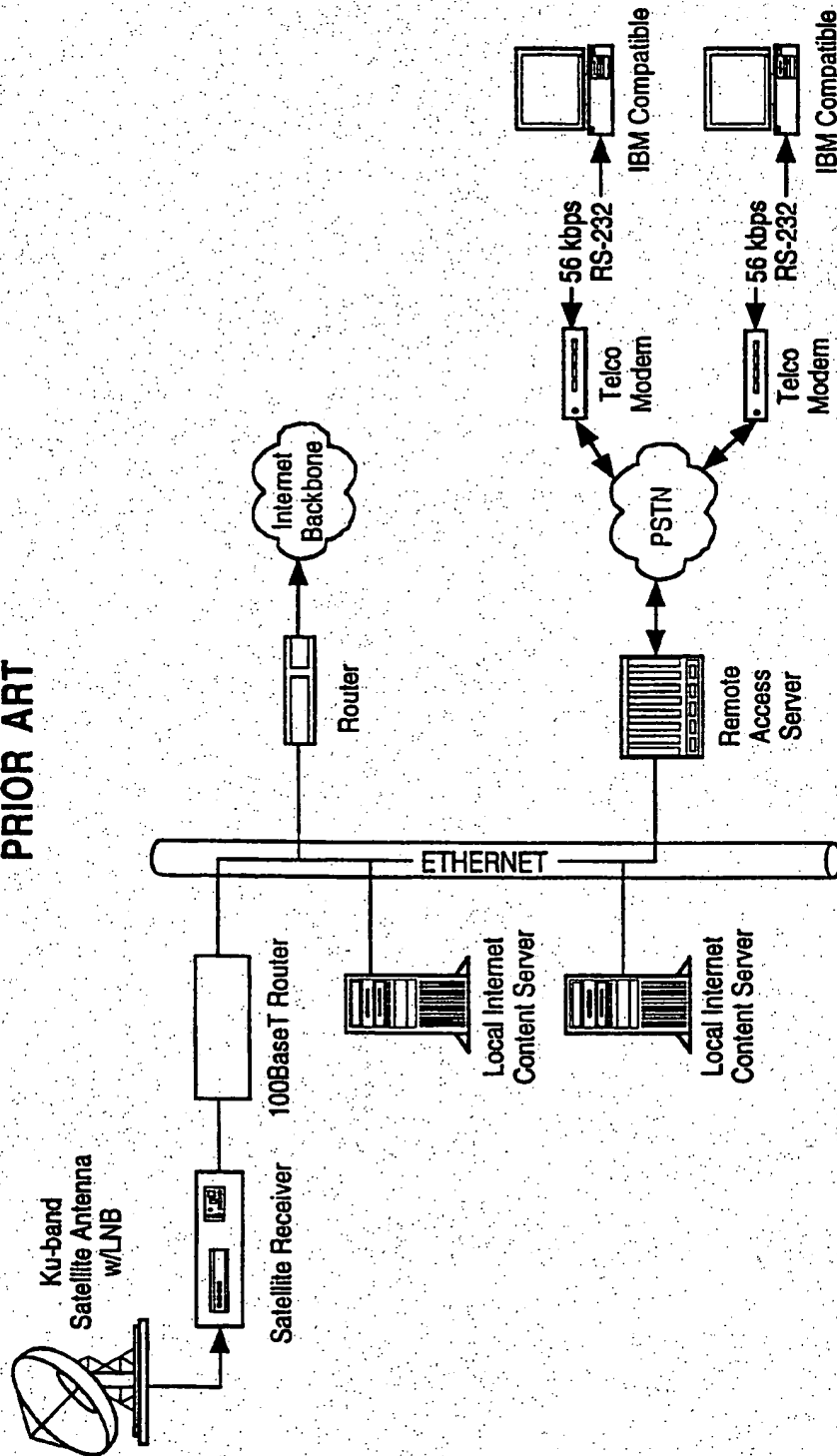


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FIG. 9

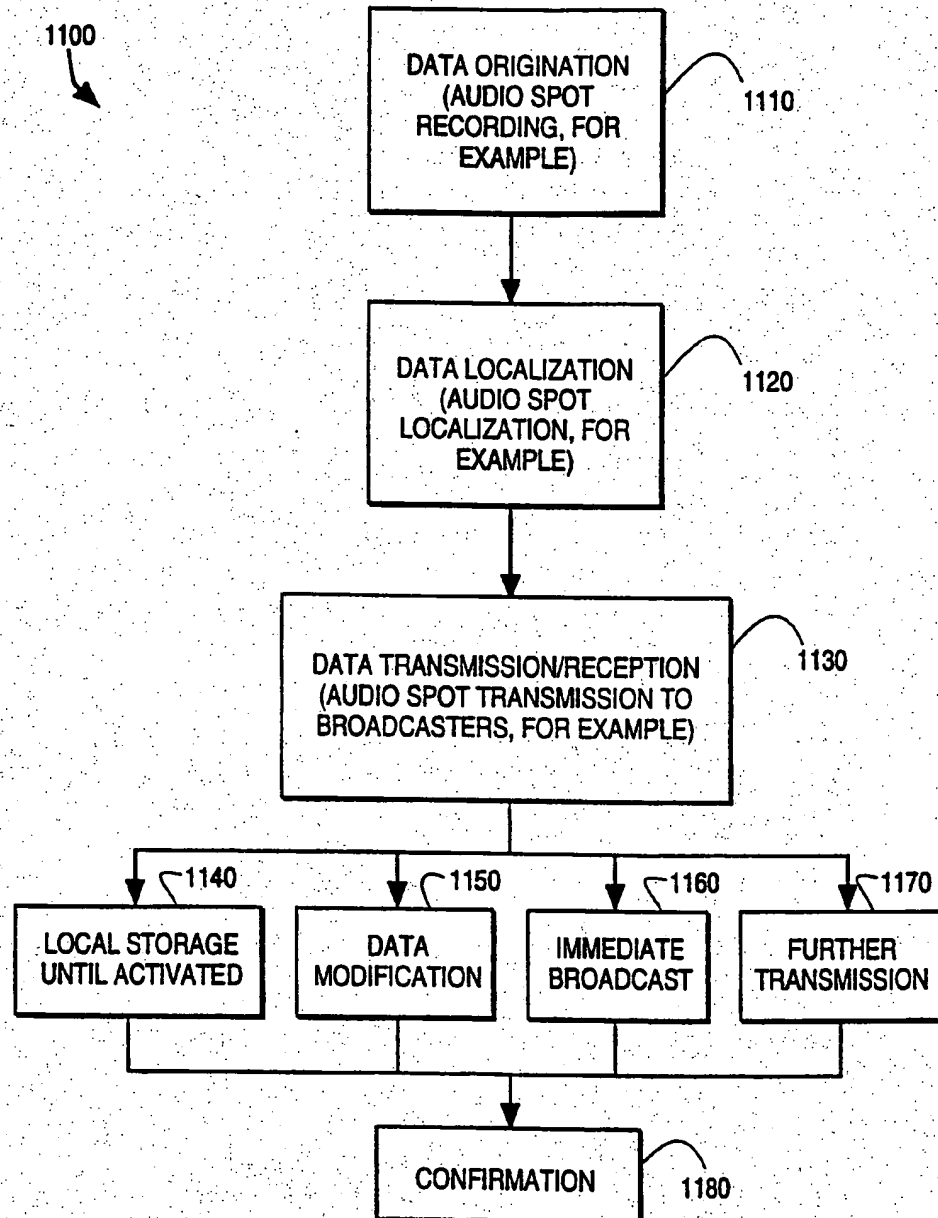


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FIG. 10
PRIOR ART

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FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/24740

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :HO4L 12/46

US CL :370/316

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : HO4L 12/46

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST, WEST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
T,E	US 5,991,596 A(CUNNINGHAM ET AL.) 23 NOVEMBER 1999	1-39
T,E	US 5,995,726 A(DILLON) 30 NOVEMBER 1999	1-19
A,P	US 5,659,615 A(DILLON) 19 AUGUST 1999	1-39

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

20 DECEMBER 1999

Date of mailing of the international search report

07 FEB 2000

Name and mailing address of the ISA/US
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